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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, DECEMBER 22, 1905.

The official report of the October meeting of the American Railway Association, which has just appeared, shows that the important vote to lengthen the time that a borrowed car may be kept without paying penalty was carried with very little discussion, as was the vote to raise the ordinary per diem rate from 20 cents to 25. This five-cent increase was approved by a vote of 109 to 4, the only strenuous objector being the New Haven road, which was represented by both its general manager and its counsel. The lawyer argued that the main object of per diem—to make cars move better—had been accomplished, and therefore the further oppression of the terminal roads was unnecessary. Chairman Hale replied to this that car movement had, indeed, been improved, but by no means enough. Moreover, he claimed that the New Haven road's purchases of new cars had not been large enough to materially increase its facilities, for the volume of business had also increased. The only real issue that the discussion settled, as between the New Haven road and its western connections, was that of the supply of cars for joint business. Mr. Higgins, of the New Haven, said that for half the year—the dull half—he could not get his connections to use his cars, each connection having enough of its own. To this Mr. Hale in reply pledged the connections—particularly the coal roads—to an equitable arrangement for the future, to be kept in effect all the year round. Mr. Hale said, in regard to the New England 96-hour rule, that 96 hours' free time had to be allowed on the great bulk of the cars in Ohio, so many exceptions being made in that state to the 48-hour rule. If Ohio roads can stand this burden, New England ought to be able to stand it. One member argued for 40 cents a day and a penalty rate of \$1.25, but the promptness with which he was voted down showed that the meeting was "solid" for the committee's figures. Mr. Hale estimates the average cost of a freight car per day at about 27 cents; and there was evidently a strong aversion to adopting any rate above cost.

The proposal to let long roads keep cars 40 days at the ordinary rate, instead of 30 days, as at present, is an important change, and it would not be surprising if the letter ballot should show a considerable vote against it. It looks like weakening the effect of the penalty principle on thousands of miles of road where it is greatly needed, for the sake of appeasing the grief of a very few roads. There are thirty railroads, operating about three-fourths of the railroad mileage of the country, which have over 2,000 miles each, and which will thus have the benefit of the 10 days' additional use without penalty; while a number of long roads, such as the Lake Shore & Michigan Southern, the Chicago Great Western, the Kansas City Southern, the Chesapeake & Ohio, and the Texas & Pacific, will not

enjoy the proposed benefit because, having few branches, their total falls below 2,000 miles. And the funny thing about it is that the New Haven road, which complains so loudly about the misfortunes due to its shortness, is one of those which will benefit by this relief which has been devised to help the long roads, for the aggregate length of its multitude of short roads is 2,088 miles. The only rational way to introduce the 40-day arrangement would be for the committee to specify the routes—such as that of the Atchison from Chicago to Los Angeles—on which the relief should apply. A long road does not need this relief on its short lines any more than does a short road. The action of the committee is to be explained presumably on the theory that in such a large and unwieldy body as this Association it is best to get what you can even at the frequent sacrifice of reason—as has been the case, indeed, in other features of the car-service reform. A number of ideals may have to remain in the background for some time to come; such, for example, as that which requires all foreign cars to be promptly returned home. Diversion of cars to get some profitable local business, and ordering illegitimate movements of cars to break penalties continue to be common, and their viciousness is recognized; but the committee has been unable to even suggest any effective rule to put a stop to the evil.

Besides the car service matter and the rules for transportation of explosives, which have already been reported in the *Railroad Gazette* (October 27 and November 3), the official *Proceedings* contains the Secretary's official report of the International Railway Congress. The expenses of the 7th Session, including the special trains for carrying the visitors to St. Louis, Chicago, Montreal, etc., were \$48,871. The report says that the reason why the time signal of May 3 was not sent around the world was the unwillingness of the Eastern and Great Northern telegraph companies to co-operate. These companies own the lines in Asia, and the signal would have passed through that part of the world in the busiest part of the day. The report pays a high compliment to the managers of the exhibition of railway appliances which was held at Washington in connection with the Congress. The report of the Committee on Safety Appliances which was presented at the Chicago meeting, says that the committee is preparing a code of air-brake rules. The Association instructed this committee to arrange for uniform tests in connection with the rules governing the determination of physical and educational qualifications of employees. The Committee on Statistical Inquiry presented a report at the meeting containing definitions of units and an elaborate blank form for reporting railroad transportation statistics. While the matters presented by the committee were

approved, the committee's explanation of its work is yet to come. This will probably be submitted at the next meeting. The Committee on Standard Cipher Code expects to have the code ready for delivery soon.

CAR AND LOCOMOTIVE OUTPUT IN 1905.

Official returns from all of the car building plants in the United States and Canada, with the exception of one of the smaller builders, whose output we have estimated from our current records, show that 168,006 cars were built during the year 1905, including cars for use on subway and elevated railroads, but exclusive of street and interurban electric cars. These figures do not include cars built by railroads in their own shops, of which an exceptionally large number have been built this year. Of the above total, 165,455 are for freight service, and 2,551 are for passenger service, 162,701 are for domestic use, and 5,305 are for export. This is the largest car output in any one year that we have yet reported, and is considerably more than double the total output for last year, which was 62,950. The next largest output for any one year was in 1902, when a total of 162,547 cars were built. During the past three months the car companies have booked some record breaking orders. The majority of these are for 1907 delivery, and among them are orders from two of the leading railroads which alone amount to almost as many cars as the total car output in 1904. During the year 2,164 cars were built by firms in Canada, an increase of 222 cars over the number built in 1904. The following table shows the *Railroad Gazette's* estimate of cars built during the last seven years:

	Cars		
	Freight.	Passenger.	Total.
1899.....	119,886	1,305	121,191
1900.....	115,631	1,636	117,267
1901.....	136,950	2,055	139,005
1902.....	162,599	1,948	164,547
1903.....	153,195	2,007	155,202
1904.....	60,806	2,144	62,950
1905.....	165,455	2,551	168,006

Official returns from all of the locomotive builders in the United States and Canada show that there were 5,491 new locomotives built in 1905, as against 3,441 built in 1904. Like the car total, this total does not include locomotives built by railroads in their own shops, nor does it include orders given for repairs or rebuilding. Of the total number of locomotives reported built, 140 were electric locomotives as against 95 electric locomotives for last year. Of the total number, 583 were for export and 4,896 for domestic use, including 177 compound locomotives. The total number of locomotives built this year exceeds the total number for any previous year that we have yet reported. The nearest number to it was in 1903, when there were 5,152 locomotives built. The following table shows our figures for the number of locomotives built during the past 14 years:

1892.....	2,012	1899.....	2,473
1893.....	2,011	1900.....	3,153
1894.....	695	1901.....	3,384
1895.....	1,101	1902.....	4,070
1896.....	1,175	1903.....	5,152
1897.....	1,251	1904.....	3,441
1898.....	1,875	1905.....	5,491

In analyzing the above reports, it is interesting to note what the totals really mean by calculating the expenditure involved. At an average cost per freight car of \$1,000, the total spent for freight cars would be \$165,455,000; at an average cost per passenger car of \$7,000, the total spent for passenger cars would be \$17,857,000, and at an average cost per locomotive of \$14,000, the total spent for locomotives would be \$76,874,000. Adding these totals shows that the total amount spent by the railroads in 1905 for motive power and rolling stock approximates the enormous sum of \$260,186,000.

MR WESTINGHOUSE AGAIN LOOKS AHEAD.

In the few letters which Mr. George Westinghouse has addressed to the public, he has divorced himself from his commercial interests and told what he believed to be true and in each case it has proved to be true. Nearly four years ago he braved hysteric public opinion by pointing out that the New York Central tunnel disaster would have involved a still greater loss of life if electric traction in the then state of the art had been in use. For this he was, as he says in his letter in another column, "harshly" criticized; he was injuring his own business, making pointless the demand for immediate change of power and curbing an irascible district attorney, who was busy and indiscriminate in attacking the hard-earned reputations of railroad officers. In his present letter he is alike high-minded. At first sight one may say that having perfected an alternating current series motor, he is a biased sci-

entific man when he says that this system is capable of higher speed than the direct current system, more economical, and does less injury by electrolytic action to underground metallic work. But he is not necessarily so biased, for his great rival has an equal right with his own company to use all patents owned by either company. This wise arrangement between the two companies was made in the interest of the advancement of the science of electric working. His statement of his part in making practicable the generation of the alternating current, twenty years ago, is too modest. In the scientific part of that invention which has made high-speed electric traction possible he ranks with other great workers in the electrical field; the practical part he accomplished almost alone.

The importance of the prevention of electrolytic action cannot be overestimated. Outside of the cities electrolysis does little damage; but the greatest current consumption on a railroad would take place in the yards and terminals in the cities and the extent of electrolytic action is proportional to the strength of the current flowing between electrodes. The enormous amount of power flowing in the ground return circuit has caused and will cause damage to adjacent parallel underground metallic structures where direct current is used, even if the most effective preventative measures are taken in the way of metallic return circuits and frequent grounding of the rails to pipes in the danger zone. With alternating current, electrolytic action is not present in destructive amounts. The fluctuating polarity of the current prevents decomposition of the metallic surfaces.

It is clear that Mr. Westinghouse does not criticize the New York Central or its electric commission for their recommendation to use the continuous current system, for he says in his letter to Mr. Newman that "there had been no such development of the single-phase system now actively under discussion as could warrant its adoption, and therefore the selection of the continuous current system by your commission of engineers was an obvious outcome of the situation as it then existed." During the period of the New York Central investigations, Mr. Westinghouse arrived at the same conclusion that its commission did, and upon his advice his company equipped the Long Island terminal with direct-current motors, taking their power from a conductor rail. In this progressive science it is of the highest importance that commercial rivalry shall not be an obstacle to the development of the safest and most economical system of heavy, high-speed electric traction.

THE WORK OF THE INDUSTRIAL COMMISSIONER.

Perhaps no modern development of railroad organization is more significant of foresight and enterprise than the creation of the industrial department and the work of the commissioner who stands at its head. For railroads to desire new industries and the development of their territory is as old as railroads; for them to set a highly trained officer to giving all his time to carry out this desire, is the modern development. The review in another column of the history and workings of the industrial department comes from information furnished in letters and personal interviews by a number of industrial commissioners. It suggests the breadth of wisdom which a successful railroad industrial officer must have about the business conditions of his territory, its resources and its industrial possibilities. It also shows the varying character of his duties in different parts of the country.

His object in every case is the same—the industrial development of his railroad's territory—but his methods vary with the natural circumstances of his territory. In the east, his particular efforts are directed to the establishment of manufactures; in the west and south, to agriculture, mining and the development of natural resources. His work, east or west, may be summed up in the phrase, "An endeavor to create conditions favorable to industrial development." The first step in bringing about this result is the collection of information. This comes from many different sources. Directly, technical and trade papers and particularly government bulletins such as those of the geological survey, furnish much material; indirectly every business enterprise within his observation adds to the industrial commissioner's knowledge. He becomes a specialist in a score of different industries. Are there towns on his line where iron ore, coal, coke and limestone are readily available? The industrial commissioner learns about the steel business more than enough to enable him to talk intelligently on the subject. Do undeveloped water powers and spruce timber exist near together on the line? The commissioner spends months in learning the pulp and paper mill business. Thus his endeavor to create conditions favorable to the location of industries results in his acquiring for him-

self and for the records of his department, complete and accurate information about all those manufacturing and agricultural enterprises in which, within his particular territory, his department is likely ever to be interested.

Through his assistance in the organization of, and his co-operation with, boards of trade and other commercial bodies and especially through his personal acquaintance with the officers of such organizations, the industrial commissioner puts himself in another way directly in touch with local conditions all along his line. According to his point of view the industrial department is to the railroad what the board of trade is to the community and for this reason close co-operation is most desirable for both. His effort is to organize the entire territory—not part here and part there—in order that if a manufacturer fails to find the exact location wanted in one town he can be directed at once to some other nearby town along the line which will meet his requirements. This close association with business organizations results in the acquaintance of the commissioner with the leading business men in his territory, through whom he keeps in touch with all sorts of business developments. Through this acquaintance and the detailed information with respect to raw materials, cheap fuels, conditions of labor, availability of manufacturing locations and adaptability of various soils which he possesses, the industrial commissioner comes to be at the head of a sort of business publicity bureau engaged in a persistent and continuous campaign for manufacturing development.

After the necessary information is collected and the territory well organized commercially, the commissioner takes active steps to get his road known as a field for business opportunities. Even if they do not produce immediate results, the distribution of industrial circulars and advertising in trade papers are found to be, in general, exceedingly profitable railroad advertising. Although the iron and steel firms among whom the St. Paul's iron ore map was so popular, and the concerns who make use of the Erie's coal, oil and gas map in their daily business, may not directly contribute any additional traffic to the road on this account, the indirect effect is to create in their mind the impression that these are roads worth doing business with when opportunity offers. In his campaign the industrial commissioner is engaged in two sorts of activities—establishment of new industries, and changing the location of established industrial enterprises. In each case the first success is the hardest. The example of one successful new industry of its kind or of one prominent firm going to a new and better location, once it is obtained, will almost surely soon be followed by others. By a thorough knowledge of the business and the situation in his territory the commissioner can often make clear to capital the possibilities of profitable development. An example of this, in a small way, is a profitable kindling wood business which was built up by the industrial department of a western road by working out a plan to use the pieces of wood previously burnt to get rid of them by saw mill companies in the lumber country as kindling wood in the Chicago market. The success of this enterprise would not have been possible if it had not been for a favorable rate given, at the suggestion of the industrial department, on these shipments. Similarly, before hemlock timber was generally known to be available for newspaper pulp, a manufacturer in touch with the department discovered that it could be successfully used, and, in connection with a large tannery which had just been established some 75 miles away, secured, through the industrial department, a rate on the hemlock lumber, after the bark was taken off, low enough to make it possible for it to be used with profit. The low rate on the kindling wood and on the hemlock logs was not a loss but a gain to the railroad company, for in both cases it created entirely new traffic and in the latter case the finished product was again shipped over its rails. These cases illustrate the close co-operation of the industrial commissioner with the traffic department. Aside from the immediate interests of his own department, the benefit of his specialized knowledge is also often called on to determine the rate to be given on a special class of goods. He must, of course, in deciding on the desirability of a certain industry, take into account the traffic interests of the railroad company, so as to locate the industry where it will be, at the same time, best situated for its own success and for its contribution to the traffic of the railroad. He must try to get traffic which will move in the opposite direction from that of the greatest loaded car movement rather than in the same direction, and must, in all the complicated rate situations which come up, consider the interests of the road along with the successful establishment of the shipper.

One of the most valuable characteristics of the industrial commissioner to the railroad is that he can take time. No freight traffic manager or general freight agent, with his rush of other duties,

usually occupying every minute and more of his available time, can find a chance to think up schemes for attracting manufacturers or spare time to devote to projects which may amount to nothing at all. What traffic official would have a chance to work up a soil map of his railroad's territory compiled from government reports and distribute it with a list of farm lands for sale; or publish a monthly newspaper devoted to the industrial building up of his territory; or work out from the best available scientific sources the cost per ton of producing pig iron at different towns on his line? Activities like these, of great importance in building up a railroad's permanent prosperity, are out of the traffic officer's reach. What's everybody's business is nobody's business, and this sort of farsighted building for the future is left undone unless there is an officer who can devote to it his whole time. No less important may be the ability to spend time on a doubtful chance. A real estate agent comes to a traffic manager of a road which has no industrial department, saying that he has in tow a large manufacturing concern whose name he cannot mention but which might be induced to locate. He wants to get the railroad's engineers to make a survey and determine the practicability of the proposed location. The traffic manager probably does not know the man and in any case knows that real estate agents' plans often go astray. He also happens to know that at the moment the engineering department needs every possible man for a certain piece of reconstruction work. To grant the request for engineers will, for this reason, mean on a blind chance a direct loss to the company of several hundred dollars. This does not seem worth while on the call of a man with plans undisclosed. He therefore does not take enthusiastically to the idea and the real estate agent may be thrown entirely on his own resources. On the other hand, if there is an industrial department, the traffic manager at once sends the inquirer to the industrial commissioner, whom he tells him is the man to be seen. The commissioner meets him, is not unlikely to have met him somewhere before, and listens to his case. After a talk, the commissioner may himself come to the decision that there is not enough in the scheme to make it worth considering. On the other hand, he may know that this particular man has a habit of landing his big fish; or from information which has come to him in the course of other dealings he may, by putting two and two together, be able to have in his own mind more than a suspicion of the very company which is considering a change of location. He knows that the location which the real estate man proposes would be exceedingly well suited to the requirements of that particular industry and also to the traffic prosperity of his company. He, too, knows the situation in the engineering department but, nevertheless, the chance is, in his judgment, well worth taking. As it is on his judgment in such matters that the other officers of the road depend, his telephoned request to the engineering department is at once honored and he can assure his visitor before he leaves the office that the examination will promptly be made. This is only the first step in negotiations which may or may not secure a large amount of steady and dependable traffic for the road; but it illustrates how effectively the industrial commissioner can treat with interested persons as the responsible head of the railroad's side of the negotiation. From the moment the project is broached, to the final closing of contracts for side-track facilities, the officers, from the president down, back up his judgment with their knowledge and authority. At the same time he consults them—the traffic manager, in regard to possibilities for reductions in a particular rate; the chief engineer, for his judgment on a side-track connection; the division superintendent, for his approval of a plan as fitting in with local conditions; and the president, in regard to plans for the future, not yet announced, which will affect the particular situation. Within his field the industrial commissioner has a very large share of centralized authority; outside it, the other officers hold their expert services at his disposal.

From this description it is not hard to see that a successful industrial commissioner must have a wide knowledge of all sorts of industrial conditions. Not only must he be familiar with businesses likely to locate in his territory but with all competing businesses as well, the source and supplies of raw material, the most available markets, changes in the trade or conditions affecting the industry, grouping within rate-making territory, the effect of the establishment of an industry on his own and other roads and almost innumerable other questions bearing on business from his railroad standpoint. He must be something of an engineer, enough of an operating man to make clear the advantages of his railroad in freight schedules and service, a good deal of a traffic man, and, most of all, a skilful dealer with other men; for it is above all by personal contact that the industrial commissioner accomplishes his work. There is nothing which impresses a business man, in

an inquiring mood, more favorably than an intelligent understanding by a railroad officer of the particular business with which he himself is so thoroughly familiar. By the commissioner's ability, through this knowledge, to put his finger on particular opportunities in his territory or by his frankness in telling a prospective manufacturer that he has come to the wrong place for what he wants, he most of all serves his railroad by making the manufacturer feel that there is a railroad in the best sense of the word and a railroad with which it is a pleasure to do business. Once this state of mind is established the rest is easy. The man may not at the time decide to locate, but his good impression of the railroad remains and is likely at some time in the future to be a distinct asset to the company. The services which an industrial commissioner can give to his railroad are in these many ways so great that the wide extension of the railroad industrial department in the fifteen years since its first establishment is easily accounted for. Acquaintance with actual results accomplished makes it surprising that all the larger systems have not yet appreciated the economy of having such an officer.

Finally it must be remembered that the activities of the industrial commissioner do not represent a survival of the old-fashioned cut-throat railroad competition; his object is not to draw away manufacturers from equally favorable locations on other lines. In accord with the modern type of competition combined with common-sense, he aims to make the largest use possible of the particular resources of his particular line of railroad and to bring about in his territory the proper economic location of enterprises poorly situated elsewhere. In a word, the industrial commissioner aims, not to upbuild his own at the expense of other railroads, but, through the development of the natural resources and opportunities of his own road, to aid in the industrial development of the whole country.

November Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of November, printed in another column, contains accounts of 26 collisions, 19 derailments, and three other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

Nov.	Place.	Killed.	Injured.
7th	Liverpool, N. Y.	4	0
8th	Hunlock's Creek, Pa.	6	3
20th	Falconer, N. Y.	2	0
23d	Albion, Ind.	7	3
24th	Wayland, Mass.	1	2
24th	Thompsonstown, Pa.	1	8
26th	Baker Bridge, Mass.	17	30
26th	South Waterboro, Me.	3	0
29th	East Everett, Mass.	0	20
30th	Penn Haven Junction, Pa.	2	12

The most notable accident in this list, that at Baker Bridge, Mass., has been reported already, so far as the facts are available. The investigation of the Massachusetts State Railroad Commission has not yet been completed. The question of discipline as here illustrated has been dealt with in the two articles which we have given in the editorial columns. To a considerable extent the different points which this case brings up in connection with discipline are applicable to the conduct of trainmen under either the time interval or the space interval method of managing trains; but, in view of the peculiar circumstances of the collision, a comparison of the relative virtues of these two systems will be found prominent in many of the discussions. We may note the main features of this comparison.

(1) The rules of the time interval system were grievously disregarded. As we have many times said, the time interval system has already been so widely discredited—has been shown to be so honeycombed with radical faults—that time employed in defending it is poorly spent; but it must be admitted that in this case the disregard of the rules was flagrant. It is not fair to throw all the blame on the system. The report of the Grand Jury says, in substance, that Rule 99, the flagging rule, as prescribed on the Boston & Maine, was not fitted to this case; and the superintendent of the division is reported to have said that he was not at all sure that he would censure the rear trainman of the local train for not going back with a red signal and torpedoes.

To hear that the Boston & Maine, or any other road, has not prescribed a suitable rule—a rule which will appeal to a grand jury as adequate and reasonable—is not surprising, for it is only by introducing a most elaborate combination of precautions, covering a page or two of the Rule Book, that a workable general rule can be formulated. The floundering of the American Railway Association Committee on this subject afford sufficient evidence of this. After trying various forms, the Committee has practically rejected all forms, and now gives to the roads of the Association simply a "principle" in one short paragraph. If the B. & M. rule concern-

ing rear protection was defective it may be that the trainman was justified in depending exclusively on fuseses. If the grand jury is wrong; if the rule required the trainman to go back when a following passenger train was due, the fault was the trainman's. In either case one of the simplest principles of the time interval was violated.

But it cannot be that the whole fault was with Rule 99. In the first place, there was Lincoln station, less than two miles from the point of collision, with an operator on duty, and yet the second train was allowed to follow the first within one minute, or at most two or three minutes. This is an entire abolition of the time interval principle, which is universally understood to mean an absolute interval between passenger trains of at least five minutes; and on most roads 10 minutes. Caution signals, in the hands of crossing gatemen, had taken the place of the true time interval.

If we allow the rear brakeman of a train to substitute fuseses for the time-honored red flag and torpedo, a new danger is introduced; we no longer have any audible signal. The fusee was originally adopted on most roads as an "additional" signal. This phrase means that the flag and torpedo are to be continued in full force. On many roads—not the Boston & Maine alone—it seems that the flag and torpedo have not been continued in full force; that is to say, not so rigidly in force as if no fuseses were used. To use torpedoes the brakeman must get off and go back; but he can use the fusee without leaving his car. The radical element of superiority in the old practice—that the torpedo gives an audible signal—is then lost. In this case a torpedo probably would have aroused Engineer Lyons to his duty. It is unnecessary to repeat in this place that even where the rules are adequate, the difficulty of training brakemen to faithfully follow the flagging rule, and, where trains are frequent, the difficulty of formulating the rule itself, are so great that the time interval system breaks down.

(2) In considering the adequateness of the block system to prevent a collision like this, the points to be emphasized are, first, the necessity of "surprise checking," and, in the case of automatic signals, the enforcement of a stop at all signals. The stop may perhaps be omitted, under suitable restrictions, in the case of heavy trains going up grade at low speed. No one disputes the superiority of the space interval, either in this case or in any other; but there has been some disposition to argue that in this case it might not have been so very much better. But it is always better, under any circumstances, because of the better discipline. Good discipline is easy; with the time interval it is difficult. While there has not yet been gathered a sufficient body of statistics of cases where block signals are disregarded to admit of precise conclusions from actual experience, no reasonable person, who has been familiar with the operation of the block system, will deny that where the rules require trains to be stopped at fixed points, the habits of the enginemen are far better than where, because of the uncertainties of flagging, the question as to where a train should be stopped or slackened is often left to the judgment of the runner. Under the block system a runner, for most of the time, has in his mind the definite idea that he has a clear track to a certain definite point ahead—the next home signal. Under the time interval he must expect a red flag anywhere. There is all the difference between certainty and uncertainty. Where the manual block system is used, the necessary check upon enginemen who may be tempted to be careless is afforded by the presence of the signalmen at each block station; and with automatic signals a suitable system of surveillance, by competent inspectors, takes the place of the monitorship which in the manual system is exercised by the signalmen.

The common rule with automatic signals is to require a full stop at any home signal which stands against the train. The duration of the stop is in some cases specified and on some roads is, we believe, as much as three minutes. Unless the signal system is inadequate, a stop of 30 seconds would seem to be short enough anywhere; and so far as mere discipline is concerned, it is long enough. To provide for the easy enforcement of this rule and to guard against unnecessary permissive running, the rule should forbid the enginemen of passenger trains to pass two consecutive block signals with only the half minute stop at each. At the second signal the stop should be longer; say five minutes or 10 minutes. The fact that two successive signals are found against a train indicates that a preceding train probably is the cause of this signal being in the stop position; and a train following thus closely ought to lengthen the time interval so as to have the benefit of the distant signals. If in such a case a signal does not clear after a period of 10 minutes, there is a fair presumption that the train ahead has been seriously delayed; and in that case there would be no advantage in closing up on it.

Block signals, both automatic and manual, have been used in such a way that the full benefits derivable from them have not been secured; and such faulty use of them tends to aid those who would argue that the space interval is not much better than the time interval. But the rational use of block signals always demolishes such arguments.

The number of electric car accidents reported in the newspapers

of the United States in the month of November was 11, in which seven persons were killed and 89 injured. Four of the killed were in cars which were struck by trains at crossings of steam railroads.

The State Railroad Commission of Kentucky, after a hearing at which evidence was given by the principal roads of the state, has issued an opinion making sweeping reductions in the freight rates on certain kinds of lumber. Woods of value must be charged no higher than ordinary lumber; logs must be carried at 70 per cent. of the lumber rates; sleepers for railroad track must be charged no higher than lumber, and no charge shall be made on stakes and other things used to secure the load on a car. The Commission condemns the practice of giving a rebate on logs which are manufactured into lumber and afterwards shipped over the same road. "Woods of value" are declared to be now not much more valuable than other kinds, classed as lumber. In connection with the rate on sleepers, it appears that most of the roads, and particularly the Louisville & Nashville, have been charging on these a higher rate than for lumber, with a view to conserving the supply of ties for their own tracks. The counsel for the L. & N. argued that the price paid by his company for ties was a fair one, and that the only persons complaining at the policy of the road were jobbers in the city of Louisville who wished to buy the ties to ship into other states. The Commissioners' opinion says:

No good reason has been shown why this practice should be permitted to prevail. It was clearly shown that cross-ties are less valuable than the low grades of lumber. In one instance the rate upon ties was at least two and one-half times that of the rate upon lumber. This extraordinary rate is now in effect upon the Louisville & Nashville, and it has been in force for a number of years. With such a rate in effect, the movement of this commodity from points upon the line of this railroad has been prohibited, and the producer has been forced from necessity to dispose of his cross-ties to the railroad companies charging this rate. While a great deal of testimony has been offered, yet nowhere do we find any attempt at a justification of this rate; indeed, counsel for the Louisville & Nashville Railroad Company very frankly admitted that there was no real justification for it.

It will not do to say that because these ties are a necessity to the railroads they should be permitted to charge a rate for their transportation in excess of what may be deemed just and reasonable for the service performed.

A railroad is a public institution enjoying the benefit of the right of eminent domain. It cannot perform its important function as a public servant without a good track, and the right referred to would doubtless be sufficient authority, in case of need, to empower it to cut trees on lands near the road, to keep up the track. But the railroad companies of Kentucky seem to have taken a short cut to improve the law. In seizing for locomotive fuel a car or a hundred cars of coal in transit, railroads have always found easy justification, in case of real necessity, provided they offered the fair market price of the coal. The tie case is not quite so simple. No public and impartial authority has been called in to decide on the fairness either of the transportation rates or the prices paid for ties. The L. & N. lawyer calls the compensation afforded by the lumber rate, as applied to sleepers, a mere bagatelle—but this suggests that the rates on lumber have perhaps been made too low by the railroads, voluntarily. It is imaginable that a railroad might make very low rates on lumber, for the purpose of developing the country along its lines, while still maintaining on "lumber" in the shape of logs suitable for ties, higher rates, yielding a fair profit, and this without injustice; but it would probably be futile, in any state, to try to convince objectors of the fairness of such an arrangement, except through a judicial decision.

The Executive Committee of the Italian State Railroads proposes the introduction of a zone tariff intended especially to encourage long-distance travel. The existing rates are substantially mileage rates, and these are to remain unchanged for distances of 150 kilometers (93 miles) or less. For that distance they are \$1.68, \$2.59 and \$3.70 for the three classes respectively. For 250 kilometers, or 155 miles, there would be but a slight reduction (28 cents, 40 cents and 58 cents) from the present fares, but for 550 kilometers (332 miles) there would be a saving of nearly a third on the two lower classes and a fourth on the first class; while for 950 kilometers (590 miles) the comparison is as follows:

	Class		
	First.	Second.	Third.
Present fares	\$23.40	\$16.30	\$10.63
Proposed fares	13.42	8.84	5.65

and for 1,500 kilometers (962 miles)—New York to Chicago) it is:

	Class		
	First.	Second.	Third.
Present fares	\$38.17	\$27.72	\$16.72
Proposed fares	16.89	11.15	7.10

These are certainly very material reductions; but it must be remembered that from the Mont Cenis Tunnel to Brindisi, almost the only long route in Italy over which continuous journeys are now made by considerable numbers of people, the distance is but 740 miles; from Mont Cenis to Naples, just 700; and while it is possible to extend the latter journey 294 miles further, to the Straits of Messina, and even across the straits 151 miles to Palermo, the number of passengers who will make such a journey without stop-

ping by the way must be very small. The tourist travel, nearly all first or second class, is a very important source of earnings for the Italian railroads, and the proposed fares are quite likely to fail of adoption because of the popular idea that they would be for the benefit of the foreigners rather than for the Italians; but actually the tourists rarely make long journeys in Italy; the attractions which cannot be missed are too near together.

A plumb bob was thrown into President Roosevelt's special train as it was passing through the northern part of Philadelphia Dec. 2, and, says a press despatch, "the Pennsylvania Railroad officials and the Philadelphia police authorities have united in a determined effort to break up the practice of throwing missiles at trains. The road has been persistently annoyed," said an officer of the company, "by the throwing of stones and bricks through car windows. This occurs usually in outlying parts of the city. The only thing that will break up the practice," said this officer, "is a heavy fine and imprisonment for the offenders when caught." And the only thing that will keep it broken up, he might have added, is to keep the police after hoodlums and mischievous boys constantly. Every large road is "persistently annoyed"; and much of the stone throwing is by boys. Mischievous boys of 14 or 15 years who are not punished, are likely to become malicious at 17. To punish only the most flagrant offenders is to tolerate a constant danger. To punish spasmodically is to ignore the fact that a new mischief maker is born every minute. In most cities, the telephone wire from the railroad superintendent's office to police headquarters ought to be worked a good deal more actively than it is.

TRADE CATALOGUES.

Automatic Wrenches.—The superiority of the Bullard automatic wrench over the ordinary pipe or monkey wrench is explained and illustrated in a pamphlet published by the Bullard Automatic Wrench Co., of Providence, R. I. This wrench works on a new principle which is to apply a twisting instead of a crushing strain. This is accomplished by compounding three separate levers, the resulting grip being modeled on the principle of the human hand. It is an automatic wrench because it will fit itself to different sized nuts or pipe without the adjusting of any screws or nuts. It can therefore be entirely worked with one hand. More than this, it can, on account of its shape, be applied to a pipe laid close to a floor, wall or ceiling, and is a ratchet and monkey wrench combined.

Bulletin No. 125, the first of the "Sturtevant Engineering Series," has just been published by the B. F. Sturtevant Company, Boston, Mass. It describes in detail the line of automatic vertical engines made by this company. These range from 5 in. x 5 in. to 12 in. x 10 in., are entirely enclosed and all bearings are provided with positive forced lubrication under 15 lbs. pressure. This method, it is claimed, has proved greatly superior to older splashing devices. These engines which were primarily designed to meet the exacting requirements of dynamo driving, are capable of continuous operation without skilled attention, and represent the highest standard of material, workmanship and efficiency.

Car Heating Apparatus.—Special Circular No. 4 of the Chicago Car Heating Co., Chicago, Ill., describes the vapor system of car heating, which is controlled by this company. The distinguishing feature of this system is that the radiating pipes are filled with steam or vapor at atmospheric pressure and a constant temperature of about 208 deg. Fahr. This is accomplished by an automatic vapor regulator inserted between the main floor valve and the radiating pipes on each side of the car. Perfect regulation of temperature and economy of steam consumption are the two principal claims made for the system.

"The Arrowhead."—The passenger department of the San Pedro, Los Angeles & Salt Lake has begun the publication of a monthly magazine of western travel and development under the above name. The first number is a creditable piece of work and contains a number of articles of interest and value, among them "The Water Salvation of Los Angeles," "Wonders of Utah," "Nevada's Marvelous Mineral Zone," and "Landmarks of California." The magazine, which is 10½ x 13½, makes a favorable appearance, being excellently illustrated and printed.

Electric Motors.—The Northern Electrical Manufacturing Co., Madison, Wis., has developed a line of box type motors, which are especially adapted for severe service such as crane and hoisting work. These equipments are completely enclosed and are thus dust proof. They are frequently built weather proof. They are equipped with extremely sturdy armature shafts and liberal bearings and a compact although accessible arrangement of the motor parts. Bulletin 32 is descriptive of these equipments.

CONTRIBUTIONS

The Single-Phase Alternating and the Direct Current Systems.

111 Broadway, New York, Dec. 19, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The railroad officials of the country are so deeply concerned in all that relates to the electrification of their lines that I deem it important to now take notice of an article which appeared in your issue of October 20, as well as of the article in the *Street Railway Journal* of October 21, written by Mr. Frank J. Sprague, one of the important engineers upon the Electrical Commission of the New York Central, which thereby precipitated a far-reaching controversy as to the relative advantages and disadvantages of the two systems of electric traction, namely, the alternating single-phase, which can be operated with overhead conductors, and the direct current system, which, for railroad purposes, requires a third-rail.

In dealing with this subject, it is well to recall that when the alternating current system was first introduced into this country by the Westinghouse Company in 1886, the advocates of the direct current system, feeling that their particular business and their efforts to secure a monopoly of the electric light and power industry of the country might, as they really have, become abortive, left no stone unturned to accomplish the suppression of this new and comprehensive electric system. Legislatures in several states were invoked to pass laws to prohibit any use whatever of the alternating electric system, and the present method of killing criminals in New York state was the direct outcome of the organized efforts of the business rivals of the Westinghouse Company, who were also enemies of the public, to use that company's make of alternating current generators for this base purpose in the hope that their legislative efforts referred to might be crowned with success.

The triumphant success of the alternating current system, without which none of our great railroads could have had the benefit of electric traction, needs no words of mine to emphasize it; but there are arrayed to-day against the alternating current single-phase system of electric traction many of the same men and the same interests, actuated by the same commercial spirit and using the same methods and tactics as were employed by them in the days referred to when they began their "peculiar" opposition to the alternating electric system.

Public discussion and the facts already demonstrated will bring discomfiture to that organization which has made a long and losing fight to acquire a monopoly of the electric light and power business of the country and will insure the acceptance in this country of the single-phase system as the only solution of the electric traction problem on main railroads, as has already been the general result of a most intelligent consideration of the subject in Europe.

In 1886 it was said by some influential people that I was making a mistake in attaching so much importance to the efforts being made at that time to discredit the alternating system. The beneficial results which have followed my efforts in that and other cases, in the true interests of users of electric apparatus, impel me to believe that I would be remiss at this moment to accede to like suggestions which have been recently made to me.

Mr. Sprague, while disclaiming that he was speaking officially for the New York Central Company, seems to have left no doubt in the minds of a large number of people that his views were those of the members of the New York Central Electrical Commission. In his haste to create for his clients a strong public opinion calculated to induce the officials of the New York & New Haven Railroad to give up their plan to use the single-phase alternating system and to take exactly the same kind of apparatus as the New York Central had already contracted for, namely, the third-rail direct current system, and in pleading the great need for uniformity, Mr. Sprague forgot to inform the public, probably as he would have done had he had more time, that he is receiving a very large retainer under a contract of years duration, whereby, though he may become Consulting Engineer for a railroad, yet he cannot do so if, in the opinion of the officials of the General Electric Company, such work or obligation may be in conflict with the interests of that company; and having a particular personal interest in his own form of control, which is suitable for direct currents only, he equally overlooked the fact that the electro-pneumatic multiple unit control made by the Westinghouse Company had been fully perfected for the operation of locomotives and multiple unit trains when operated by the alternating single-phase or the direct current.

Your article above referred to also tended to mislead its readers upon most important railroad questions, because it seems to have been written with a knowledge of only one side of a situation and thus under an impression that the action of the New York, New Haven & Hartford road might prove not helpful, as it will, but rather disadvantageous to electric traction in general.

Believing that a great effort had been inaugurated to fasten

upon the railroads the direct current third-rail system as a standard, through a specious appeal in this particular case for uniformity, and knowing that nothing more harmful could happen to railroad interests than to extend that system, I wrote a letter, after a conference on the subject, to President Newman, of the New York Central, and inclosed therein a letter from Mr. B. F. Lamme, Chief Engineer of the Westinghouse Electric & Mfg. Co., in criticism of observations made respecting the action of the New York, New Haven & Hartford Railroad. Copies of these letters are inclosed herewith for your perusal and publication.

An intelligent public discussion of these important questions cannot fail to be of the utmost benefit, and in saying this I have in mind the rather harsh criticisms made of my letter published in the *Railroad Gazette* of Jan. 17, 1902, written in a spirit of friendliness and helpfulness to the New York Central officials, who were, in my opinion, being misjudged with reference to the accident which had shortly before occurred in the New York Central tunnel. The result of that discussion has, as all know, been the development of the steel car, so that there are now a number of firms ready to supply non-combustible cars which are superior to the old form; in fact, the Interborough, the Pennsylvania, and the New York Central have all ordered steel cars in large numbers and no one would now think of doing otherwise.

In conclusion, I wish to say that the single-phase alternating current system not only equals the direct current system in every particular, as fully set out in Mr. Lamme's letter, but in several respects has advantages of supreme importance, two of which I will particularly refer to.

No problem is of higher importance than that relating to the avoidance of the destruction by electrolytic action of all underground metallic work such as employed in the great improvements of the New York Central, the Interborough and other underground work yet to be undertaken, and the water and gas pipes of New York. These works have been created, not to last a decade, but are intended to, and should, endure for ages. It has been shown fully and completely that the direct current is working all of the time in the destruction of some of the metallic structures, especially water and gas pipes, adjacent to electric conductors, which metallic structures invariably act as conductors for some of the current escaping from the uninsulated rails forming part of the electric circuit in railroad operations.

In illustration of this electrolytic action of continuous currents, I enclose a photograph with memorandum of explanation showing the electrolytic action due to the leakage of electric current from a street railway line in East Pittsburg. I do not pretend that the rapidity of action in this case is likely to occur, except under extraordinary conditions. Had, however, the alternating current been used, there would have been no electrolytic effect whatever. This electrolytic difficulty is a well known one. It cannot be hid or covered up and must be surmounted, because the sum involved in this phase of the electric problem is so great as to justify every possible effort to avoid its rapid depreciation or loss.

In the matter of the regulation of the speed of trains upon standard railroads, the single-phase system will have it all its own way, because with the continuous current no speed can be attained greatly in excess of the predetermined one. In railroad practice it often happens that speeds of 70 and 80 miles per hour are necessary to make up for time lost. If the direct current motors are constructed for this speed, then at the ordinary speeds of 40 or 50 miles there would have to be introduced a dead resistance in the motor circuits to reduce the voltage, which condition can be maintained only for a short time, and is in effect not unlike applying a brake to hold the speed down. The only other way to maintain an average low speed would be to put the current on and off, an intolerable and uncomfortable practice one frequently observes when a motorman is obliged to move a street car at a slow speed. In the single-phase system, the auto-converters used in connection with the locomotive and car equipments provide for continuous running at any desired speed in a manner equivalent to the placing of the throttle and reverse lever in appropriate positions.

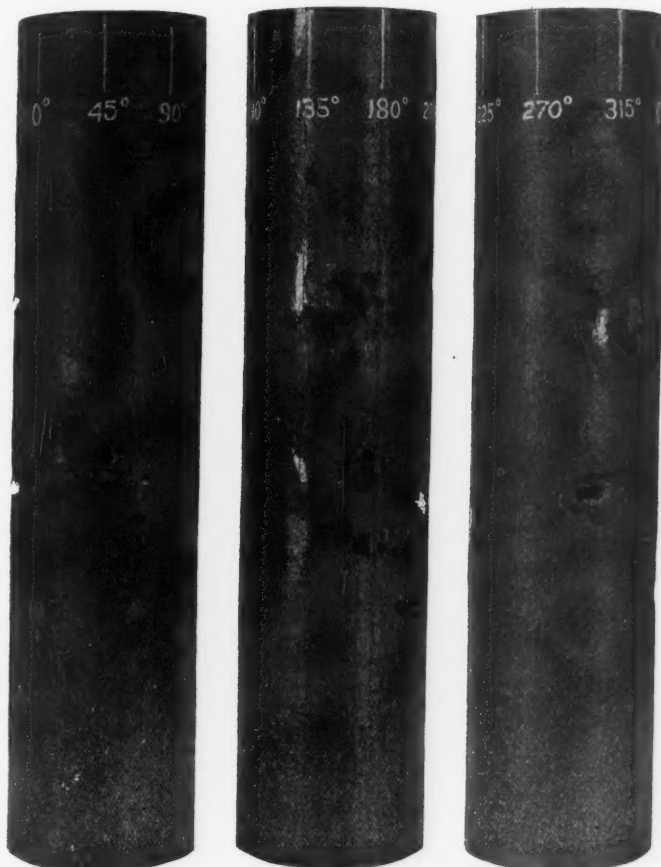
My references to Mr. Sprague and his article and his interests are reluctantly made and are not to do him an injustice but to prevent an injustice being done to vast interests by the forgetfulness referred to.

GEO. WESTINGHOUSE.

A Remarkable Case of Electrolysis.

The accompanying illustration shows the results of the electrolytic action referred to in the preceding communication of Mr. Westinghouse. This piece of pipe was recently removed in the condition shown from one of the natural gas wells on the property of the Westinghouse Electric & Manufacturing Co. in East Pittsburg, Pa., after having been installed just 30 days. The action was found to be due to electrolysis, caused by stray currents from the street railway system. This gas well was in operation for several years

with 2-in. tubing, consisting of bare steel pipe with no preservative or other protection. The well suddenly gave out, and upon pulling the tubing it was found that for 30 or 40 ft. above the rubber packing (located about 1,800 ft. down for preventing access of water to the gas bearing strata), the pipe was greatly reduced in thickness, more or less uniformly, but broken entirely through in several places, thus causing the well to be "drowned out." As the well goes through salt water strata and there is some sulphur in the surface waters, this was believed to be the cause. As a supposed remedy new tubing was installed protected by a japanned coating inside and outside, known as "Loricated" tubing. The piece of pipe shown is a portion of this tubing and shows its condi-



Effect of Electrolysis on Iron Pipes.

tion after 30 days' use. The action was immediately diagnosed as electrolytic entirely, and was, of course, aggravated because a very slight defect in the coating concentrated electrolytic action at these spots, thus causing an aggravation instead of a remedy. To cure the trouble, careful observations were made as to the source of current, and a slight flow of current was found at all times with very heavy flows during the busy hours of the street car line. After installing the new tubing several insulating joints were inserted in the casing in the hope that these will prove a remedy.

Arguments for Single-Phase Traction on the New Haven.

At the time of the announcement of the awarding of the contract for equipping the New York, New Haven & Hartford with single-phase a. c. locomotives to run into the new Grand Central Station, there was a discussion as to the practicability of adopting this method of electric traction for use over the portion of the New York Central's lines to be equipped with d. c. apparatus. At that time, the Westinghouse Electric & Manufacturing Company, to which the New Haven contract for the single-phase equipment had been given, had not proved its ability to operate, without error, a. c. motors on d. c. current. We print below two letters from officers of this company which state the possibilities of the single-phase system:

To W. H. Newman, Esq., President,
New York Central & Hudson River R. R. Co.,
Grand Central Station, New York.

Dear Sir.—There can be no more important questions before you and your officers than those involved in the present electrification plans for your New York terminal and adjacent suburban lines.

When your company, under public pressure and legislative enactment, undertook the change in your terminal facilities involving the use of electric power for your cars and trains, there had been no such development of the single-phase system now actively under discussion as could warrant its adoption, and therefore the selection of the continuous current system by your commission of engineers was an obvious outcome of the situation as it then existed, notwithstanding there had been enough progress made with alternating current single-phase traction to warrant frequent references in my conferences with you and your officers to the possibility of that system being perfected in time for a change in your plans.

The business relations existing between your company and those I represent, and the consideration you and your officers have always given my personal views on the subject of the electrification of your railroad, seem to demand the prompt fulfillment of my recent promise to set out to you in a letter the reasons why, because of the possible much greater use of electricity upon many of your lines of railroad, your company could and should now change your plans providing for the use of the continuous current, third-rail equipment, to those employing the alternating current, single-phase, overhead system.

These are some of the controlling facts as they have been developed:

1. Motors can be as successfully and economically operated by single-phase, alternating currents as by continuous current, with the advantage in favor of the use of the alternating current that the great variations in speed requirements of a railroad can be more easily and economically met thereby than by continuous current.
2. Single-phase electric locomotives larger than you require have already been constructed and operated by current from overhead lines.
3. Electro-pneumatic, multiple-unit control has been perfected whereby trains fitted with alternating current motors can be better operated than those propelled by continuous current.
4. Both locomotive and car equipments with multiple-unit control have been evolved, whereby either the alternating or direct current systems of distribution can be used.
5. If there is any desire for the use of the storage battery system, such batteries can, with rotary transformers, be as well utilized in connection with the single-phase system as with the direct current system.

Comparative Costs.

Bearing upon these great questions are the comparative costs of the line equipment of the two systems.

As an example, the comparative costs of line and sub-station installation for alternating current, single-phase, and direct current to meet the conditions of traffic now existing on the section of the New York, New Haven & Hartford from Woodlawn to Stamford, are given below, based on the following:

(a) Single-phase, alternating current, high tension transmission, transformer sub-stations, 6,000 volt overhead line supported by catenary construction from bridges spanning four tracks.

(b) Direct current employing high-tension, alternating current transmission, rotary converter sub-stations and third-rail at 600 volts.

Comparative Cost Per Mile of Four-Track Line.

	System	
	Single-phase alternating.	Direct-current.
Sub-stations	\$1,714	\$16,150
Contact line	12,436	18,872
Transmission line	1,815	2,181
Track bonding	308	308
	\$16,273	\$37,511

Difference per mile in favor of a. c., single-phase, \$21,238.

Comparative Cost Per mile of Double-Track Line.

	System	
	Single-phase alternating.	Direct-current.
Sub-stations	\$1,542	\$13,840
Contact line	6,750	9,436
Transmission line	1,815	2,181
Track bonding	154	154
	\$10,261	\$25,611

Difference per mile in favor of a. c. single-phase, \$15,350.

These figures mean, assuming that your company may in the near future electrify its main lines from New York to Buffalo, that the extra cost of the line equipment with the continuous current system for 450 miles of four-track road of the New York Central main line would amount to \$9,000,000, and for the double-track of the West Shore road, \$6,750,000. From these figures you can easily compute what the additional cost would be upon the entire mileage of the New York Central's other lines east of Buffalo and those west of that point.

This great difference in the first cost of the continuous current system with the almost absolute certainty that traffic depending upon the third-rail will be subject to many interruptions during your severe winter months, coupled with the constant danger from live third-rails upon the surface, would seem to make most fortunate the advent at this moment of the complete system of overhead, single-phase apparatus, before any great quantity of car and locomotive apparatus has been constructed on your order, or the

New York, Oct. 27, 1905.

line and overhead construction has been begun under your extensive plans.

Stated briefly, your situation seems to be this: Your power house and its equipment now under construction is suitable, without substantial change, as are also your sub-station rotaries and storage batteries, for the operation of single-phase equipment. Orders have been placed for 35 electric locomotives costing, say, \$900,000, and 180 electric car equipments with multiple-unit control, involving an additional \$775,000. Neither the locomotives nor the cars and equipments will be needed before September of next year, according to your present desires, but most probably not before April in the year following, because of the inevitable delays in the carrying out of so important a work as you now have in hand.

Had the order for the locomotives and equipment been placed with the Westinghouse Electric & Manufacturing Co., that company would have been very glad to have taken up with you a change in programme on a reasonable business basis, and I assume that your contract relations with the General Electric Co. are or such a character that you can also ask them to discuss the change in the character of equipment or arrange with them for a specific sum to cover the amount they have already expended, with such profit as they are likely to make from the completion of the work. Such sum ought to be an unimportant item as compared with the costs which may result from the completion of the work along the lines of your present plans. We are aware that the General Electric Co. has admitted its inability to produce locomotives of the character which the Westinghouse Company has contracted to supply the New York, New Haven & Hartford, but such admission on its part does not really affect the question of the Westinghouse Company's ability to produce such apparatus in the necessary quantity and in the time required.

You know of the diametrically opposed views and interests of the Westinghouse and General Electric companies and of the strife between them. You also know of my full recognition that the works of the former company being upon your line at Schenectady, it is natural that your company should give the General Electric Company at least a preference in the placing of contracts for electrical machinery.

The greatest difficulty in arriving at a conclusion is likely to be due to the commercial rivalry between the two electric companies, but there seems to be no good reason why your company should be a victim of such commercial strife. I feel confident that my recommendation that you now take steps to effect the change from your present plans will be found to be based upon the best of reasons and that that recommendation will in all probability prevail if the matter is most carefully investigated, as I am sure it will be.

I am sending Mr. Wilgus a letter with some technical correspondence, of which I have pleasure in enclosing you herewith a copy, with a hope that you may find time to read the same.

Inasmuch as many of your Directors know only the one side of this important situation, am I asking too much of you to have my letter placed before them? I ask this because of my very great desire to have my suggestion that your company now make a change fully understood and appreciated by your associates. Believe me,

Very truly yours,

GEORGE WESTINGHOUSE.

Pittsburg, Pa., Oct. 27, 1905.

To Mr. E. M. Herr, First Vice-President, Westinghouse Electric & Manufacturing Co.:

I have noted Mr. H. H. Westinghouse's letter addressed to you, in which he gives the result of a conversation with Mr. Wilgus, of the New York Central, in which Mr. Wilgus brought forth certain reasons which, in his opinion, militated against the use of single-phase apparatus in the New York Central terminal. While the comments in Mr. Westinghouse's letter are under certain more or less definite heads, for the purpose of clearer discussion, I will set forth my views under somewhat more general headings:

Locomotives.

It has been assumed in the communication referred to that owing to the apparent novelty of the design of the New Haven locomotives, insufficient time is available to produce a successful single-phase locomotive in order that it may be ready for the date set for the proposed operation by electricity of the New York Central terminals. Our opinion on this matter is that this single-phase locomotive operated as a direct current equipment comes much nearer to standard, well-accepted direct current practice than the locomotive adopted by the New York Central for its service.

The type of mechanical construction, using swivel trucks, is very similar to that universally used on heavy electric traction cars while the method of control, involving series-parallel operation of the motors, is common practice everywhere.

The type of motor used is not a radical departure from direct current practice, except in minor features of construction. The motors are extremely well protected from dirt and moisture, and they possess certain features which make them superior to any large direct-current motors yet built by any concern, more especially as

regards entire freedom from "flashing," "bucking" and difficulties of commutation, not to speak of the great advance which has been made in the application of forced ventilation.

If the Westinghouse Company had been asked to build passenger coaches fitted with four motors of the capacity used on this locomotive, these motors to be operated with the usual electro-pneumatic, series-parallel control system, there would have been no hesitancy in undertaking the contract, and it would not have been considered necessary to have made a long test on a trial equipment. The problem would have been considered as merely a further development of the type of equipments now operated on the P. N. Y. & L. I. R. R.

On the other hand, the long time taken by the New York Central for testing and experimenting was but a natural precaution, in view of the many radical departures from standard practice which were incorporated in its locomotives. For instance, the type of motor used on the New York Central locomotive is entirely open and exposed to dirt and weather conditions. This construction is a radical and questionable departure from what experience in railroad work has taught us is good practice, and it would have been folly to have attempted to put such machines in operation without very long and extended tests. Aside from the mechanical features of this equipment, the motors electrically and magnetically are such as had never been tried out by the experience gained by long service.

The result of all previous experience in electric traction has apparently been abandoned in the New York Central type, and I consider that that locomotive is an infinitely greater experiment than any that the Westinghouse Company could be considered as offering in the New Haven type.

In the course of our consideration of this problem, nothing has developed which leads us to have any doubt as to our entire ability to meet the requirements of delivery with an entirely successful locomotive.

Operation.

It is interesting to note that these locomotives have been generally referred to as "single-phase" or "alternating." We, among ourselves, have used these terms and perhaps are responsible for the nomenclature. In reality, however, the equipment of these locomotives is simply a high-class, direct current arrangement adapted for operation on alternating current as well.

The motors are not primarily designed for alternating current and adapted for operation on direct current, but knowing the problem which we had to meet, they were in reality designed for the very highest class of direct current service, and they will operate successfully on alternating current. In accomplishing this result, the fundamental features which make for a good direct current railroad motor have not been slighted, but on the contrary they have been amplified in order that the motors may work successfully on alternating current. We may take it as a fundamental condition in this class of work that in order that a motor work successfully on alternating current, it must be an extremely good direct-current motor.

Method of Control.

It has apparently been assumed, although the example of many of our single-phase roads is to the contrary, that a multiple-unit system of control is not possible or feasible with the types of equipment which we are building for the New Haven road. This is, of course, an error, but it is probably brought about by the fact that only the electric system of multiple-unit control has been kept in mind, whereas the system which we use is the electro-pneumatic. It has further been assumed that, with any system of control, duplicate apparatus is necessary for d.c.-a.c. operation, which, of course, is another misconception, as the type of control which we are building for the new locomotives, and which is also in use on other of our installations, involves the employment of the same controller for both alternating current and direct current service.

This assumption has also called forth criticisms of the complications and difficulties in passing from direct current to alternating current, or the reverse, and much stress has been laid upon the awkwardness of having to employ two systems of control. As a matter of fact, roads now using this system pass from one current to the other at speeds as high as 50 miles an hour without the slightest delay or any indication to the passengers that such a change has been effected. The whole mechanism to accomplish this is of the utmost simplicity and reliability.

It should be borne in mind that when multiple-unit control is referred to, we do not mean that form which depends for its operation upon the use of the line current, but upon the form used successfully and exclusively by our company, namely, the electro-pneumatic system, which depends for its operation upon the use of compressed air.

The type first mentioned, that is, the straight electric control, is obviously but ill-suited to use on a.c. or a.c.-d.c. systems. Our company has from the first appreciated that the type of control which we have adopted is practically the only one which can be used either on d.c. or a.c. or d.c.-a.c. systems without additional prohibitive complications.

If the New Haven road should decide that it wishes to operate its

suburban or any other service by multiple-unit trains, there is no reason why we cannot furnish entirely suitable equipments for d.c.-a.c. operation.

Power Consumption.

In Mr. Westinghouse's letter it is stated that the single-phase locomotive when used on d.c. and running at low speed requires double the amount of energy compared with a locomotive designed for direct current only. This statement, when read by itself and without any other consideration of the conditions, is apt to lead to very erroneous conclusions. The statement is true only when the d.c.-a.c. locomotive, which we have sold to the New Haven is compared to the case of a d.c. locomotive equipped with four d.c. motors, where all four can be thrown in series on the low speeds. Where the ordinary series-parallel control is used, such as on the Interborough System and the New York & Long Island Road, and which also is proposed for the New York Central multiple-unit cars, there will be no essential difference in current consumption between the d.c.-a.c. and the straight d.c., provided the equipments are designed for the same normal car speed.

In criticising the apparent disadvantage in economy of the d.c.-a.c. locomotive at low speeds, it would be only fair at the same time to show its superiority on the higher speeds, which I will point out later more than offsets this apparent disadvantage in power under which it operates at the very low speeds.

It is true that the d.c.-a.c. locomotive, equipped with four motors, will at certain very low speeds consume what appears to be a large percentage excess of current over the straight d.c. locomotive equipped with four motors, but it should be remembered that this condition of lowest speed also means the point of least power consumption. This being kept in mind, it can readily be seen that a large percentage increase of current actually means only a small increase in power requirements.

At higher speeds, the conditions, when comparing the two types of locomotives, are exactly reversed, the locomotives which we are building being of greater economy at the various higher speeds than those with which they have been compared to their disadvantage.

At one-fourth speed the total power consumption of the d.c.-a.c. or the straight d.c. locomotive is in no sense a controlling feature. It is the power required to accelerate the locomotive up to its full speed that is of importance, and also the power consumption when running at high speeds.

The New Haven service up to Woodlawn may be considered as consisting of three sections: First, a short section where the speed may possibly be 6 miles an hour; a second section where the speed may possibly be 26 miles an hour, and a third section where the speed may possibly be 45 miles an hour. The total power consumption of a train on the first section, whether with d.c.-a.c. or straight d.c. equipments, will be small, due to the shortness of this section of the tracks, and to the fact that the input of the motor at these lower speeds is a minimum.

On the second section the d.c.-a.c. and straight d.c. will be very nearly at par.

On the third section, where a high-speed service is required, the d.c.-a.c. locomotive, as designed for the New Haven road, will present considerable economies over the straight d.c. locomotive as adopted by the New York Central.

It should be remembered that the higher economy gained with the utilization of larger amounts of power will offset a very large per cent. of loss in economy at the low speed when very small amounts of power are required.

The results of a comparison of a typical run on the New Haven service showing in the first case the d.c.-a.c. locomotive which we propose to furnish, and in the second case a straight d.c. four-motor locomotive adapted to handle the same train service are shown in the table below.

New Haven locomotive.				Four-motor direct-current locomotive equivalent to New Haven			
Speed, m. p. h.	Time, seconds.	Kw.	Dist., ft.	Speed, m. p. h.	Time, seconds.	Kw.	Dist., ft.
0 to 6	13	654	59	0 to 6	13	327	59
6 to 21.5	58	150	570	6 to 21.5	58	75	570
	36	654	...	9.5 to 21.5	29	327	...
21.5 to 25	12	654-420	1,715	21.5 to 25	12	654-420	1,715
25 to 25	52	240	3,632	25 to 25	52	240	3,632
25 to 45	240	720	3,632	25 to 36	209	420-210	...
45 to 45	88	303	...	36 to 25	36	182	210
45 to 25	14	0	23,749	25 to 25	8	0	23,749
25 to 25	25	240	24,649	25 to 25	25	240	24,649
25 to 32	28	720-486	...	25 to 25	25	420	24,649
32 to 25	5	0	25,906	25 to 29	28	420-304	...
25 to 25	25	240	26,761	29 to 25	4	0	25,906
25 to 25	25	240	26,761	25 to 25	23	240	26,761
25 to 46.6	404	720-312	...	25 to 44.8	45	1,392	...
46.6 to 0	262	0	62,357	44.8 to 61.4	183	1,392-570	...
				61.4 to 0	382	0	62,357

From which it appears that the actual energy per ton mile required by the d.c.-a.c. locomotive is almost identical with that required by a straight d.c. locomotive under the same conditions of service.

Effect on Power House and Sub-stations.

If reference is made to the foregoing table, which shows the relative power requirements of the two types of locomotives at vari-

ous speeds, it will be seen that as regards the fluctuation in the power supplied, the d.c.-a.c. will represent an easier condition than the straight d.c. locomotive, as the load will be very uniform. While the minimum load will be greater than the straight d.c., the maximum or peaks will represent less power. Such a condition is in reality more ideal and much easier on the power house or sub-station than one where the same total power represents greater maximum and minimum values. The ideal condition as regards efficiency at generating and sub-stations would be a constant power or a constant load, and we come nearer to this condition with our d.c.-a.c. locomotive than is obtained by the New York Central type on the basis of the same total power consumption in each case.

In conclusion, I believe that the statements made herein are a sufficient refutation of the views set forth in Mr. Westinghouse's letter. The New Haven road, however, in adopting apparatus for single-phase operation, is looking further than the limitations imposed by the terminal requirements. The engineers of the New Haven road recognize that the extension of electric operation was absolutely prohibited, both for physical reasons and reasons of economy, if direct current was adhered to.

The necessities of economical high-speed railroad service require that power shall be drawn by the system in proportion to the work it has to do. The trains must at times run at full speed, at intermediate speed and in emergencies at extremely high speeds to make up for loss of time. The single phase, a.c. locomotive or equipments are the only feasible type which draw power in exact proportion to the work to be done. Direct current equipments have but two or three points of maximum economy. They have no ability to go beyond a certain maximum speed, which is a frequent requirement of railroad service. At all other speeds, except these few economical points, power is wasted in regulating the speed. The single-phase, a.c. equipments utilize power at all speeds at maximum economy. I believe that this feature alone is sufficient justification, aside from the many other advantages of the system, for its adoption by the New Haven Railroad.

B. G. LAMME,

Chief Engineer Westinghouse Electric & Mfg. Co.

Fire Protection Precautions at the Stuyvesant Docks.

BY H. W. PARKHURST.

In the *Railroad Gazette* of March 31, 1905, there was an article by the author on the Stuyvesant docks fire of Feb. 26, 1905, giving some account of it, and particularly discussing in what respects provision had been made for preventing, and for handling, a conflagration. It was stated that many provisions had been made both for preventing and for fighting fire, but that the combustible nature of the construction made it practically impossible to stop the complete destruction of the whole plant when once it had been fully kindled; all mains, hydrants, sprinklers, fire-walls, fire-proofing and fire-resisting provisions not serving to stop the devouring element after its volume had grown to a certain size. In concluding the article, the suggestion was made "that the construction of fireproof buildings for the storage of combustible freight might not be thought expedient or economical," and that the problem was a difficult one to solve, at least with satisfaction.

Since that great fire nearly nine months have elapsed, and the problem is now approaching a solution—whether satisfactory or not, it remains for a trial of the devices and methods adopted by the Illinois Central in the reconstruction of its terminal facilities at Stuyvesant Docks to determine. Certain changes have been made in the style of the plant and in the details of the work done, but the general scheme of a great wharf, two elevators and three great warehouses for receiving, handling, storing and shipping grain, cotton, lumber and kindred and allied products has been perpetuated, and only such changes exist as were rationally necessary, dictated by several years use of the old plant.

A general plan of the former plant was shown in the *Railroad Gazette* May 13, 1904. Comparing that plan with the revised general plan of the present arrangement shown herewith hardly a change is noticed. One or two buildings are a little longer, a track here and there has been extended or moved, and a minor building has been omitted or replaced by a combination of several smaller ones. But generally the new structures are on the exact sites of the older ones, and this is so mainly because the old foundations were about all that were left after the fire had been put out and the wreck was cleared away. The pile foundations of elevators, freight-houses, wharves, etc., were generally uninjured and a certain amount of the concrete, stone and brick masonry, resting on these piles, and generally nearly or quite below the surface of the ground, was intact and as good as ever. Also, in the wharf work, a portion only of the piles was burned; and some wharf, and even some sections of the wooden wharf-shed, was not destroyed. Therefore the rebuilding was essentially on the old lines.

In order to explain just what changes have been made, and to state their object, the several structures built will be taken up in order, comparing the new and the old, and thus make the improvements clear. First to be considered are the two elevators.

Elevator D, the one first put up, was made originally in the usual style of wooden crib-work supported by heavy timber posts on masonry piers and on pile foundations. It had seven receiving sinks and elevators located between the tracks running through the elevator, and four shipping elevators delivering to four conveyor belts running out to the wharf. There was also a conveyor belt in the elevator to assist in the handling of grain, and a complete dust collecting system. The elevator building was covered with corrugated galvanized iron. It was operated by machinery installed in a brick power house adjoining the elevator about the middle and separated from it by brick fire-walls. A complete system of water pipes from tanks on the elevator roof supplied hydrants on each floor of the elevator and relays of hose on hose-reels were furnished on the several floors, machinery, scales, bins, etc. In other words, it was a fairly complete wooden elevator as built, say, ten years ago. This is being materially changed as rebuilt, not merely for giving better facilities but also with reference to fire resistance. The foundation has been much enlarged by driving additional piles. New boilers were also furnished. The principal changes as to fire protection were in the construction of entirely new conveyor galleries, both from the elevator to the wharf and also on the wharf, of completely fireproof character; structural iron work protected by concrete and corrugated iron being the materials used throughout, as shown in the detail plans herewith. As the old conveyor galleries are generally said by eye-witnesses to have acted as flues,

to which a system of internal pipes for water was connected, fully equipped with hydrants, hose, etc., on each floor of the elevator. This was independent of a complete system of "Grinnell" sprinklers, which was installed in accordance with standard insurance rules throughout the whole elevator from roof to basement. This apparatus

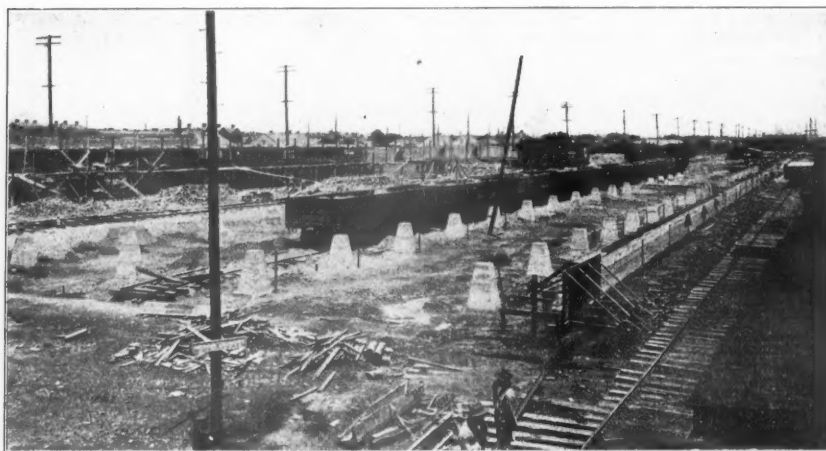


Foundation of East Freight House.

was designed to act automatically, being operated directly by the heat opening each one of a series of sprinklers set on pipes in groups near the ceilings, the elevator heads and legs, spouts, etc.; in fact, near all combustible or easily burnable material in the elevator; the purpose of these being, of course, to throw out sprays of water as soon as the heat should be raised to such a temperature as to open the sprinklers and so to wet down any stuff that might easily burn and thus stay combustion. This style of apparatus is especially effective in mills of all kinds and its instalment always lessens the insurance rates when properly placed in use. It would undoubtedly be effective in the earlier stages of a fire, but less so as the fire increased in volume. How much service it actually did at Elevator E no one can tell.

The newly built Elevator E has been modified from its earlier form in several respects. For greater convenience of operation another set of sinks has been put in and there is now a set each for receiving and for shipping grain. The cupola on top of the elevator has been correspondingly changed to make proper space for the belts, legs and heads. But few other, and those but minor, changes have been made within the building, but the exterior conveyor galleries to and on the wharf, like those for Elevator D, are of steel, iron and concrete, with the same object of furnishing nothing which can burn and so cutting the fire risk down to a minimum. With all these galleries made of metal, and the posts supporting them covered with concrete, they should stand as long as the wharf remains to support them, and cannot furnish fuel to swell another fire.

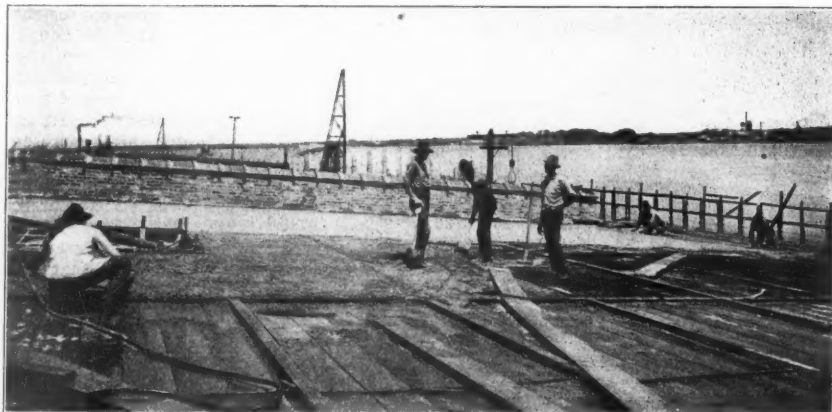
The wharf system extends from Louisiana avenue to Napoleon



Foundation Work on Cotton Warehouse.

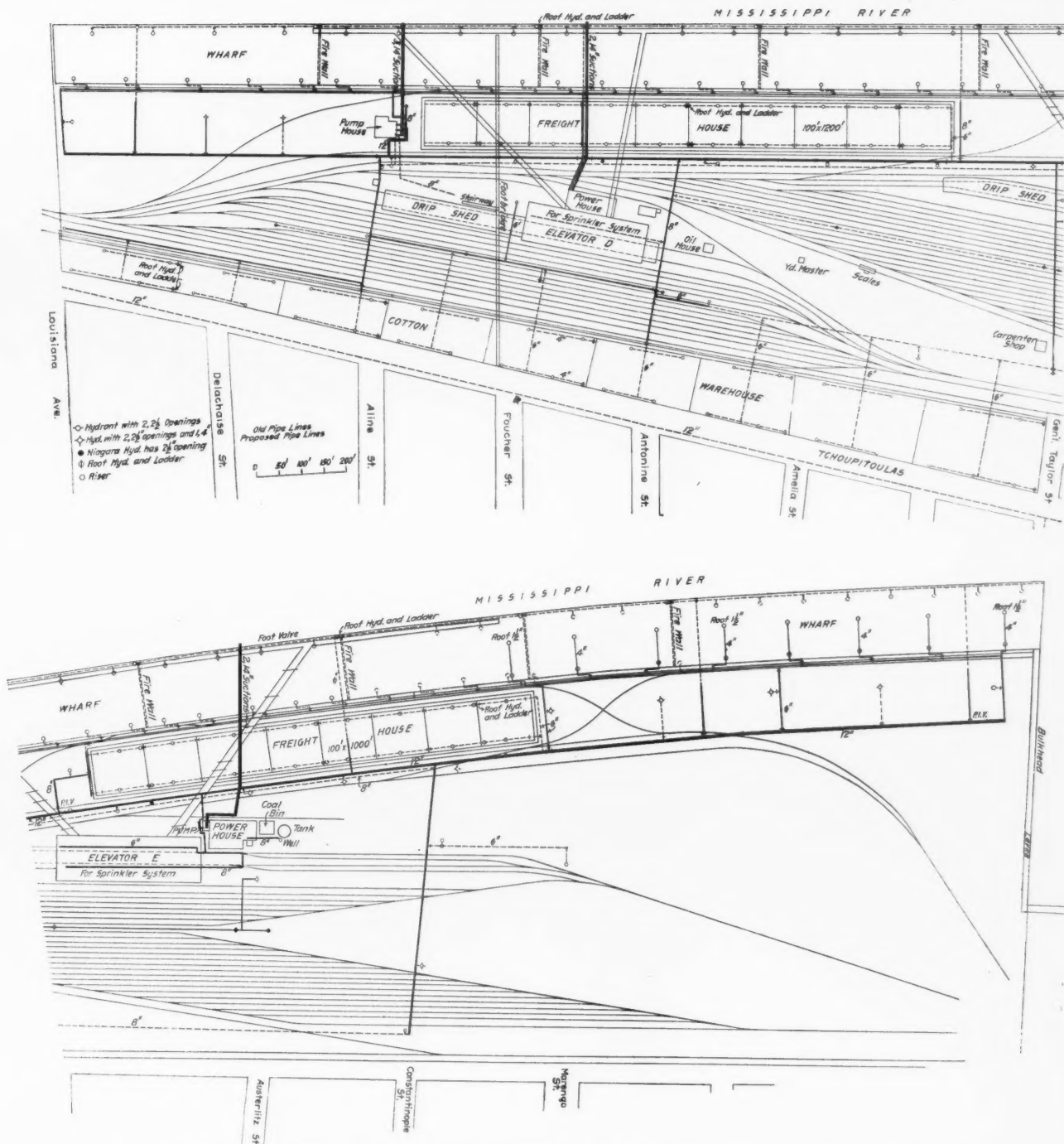
extending the fire rapidly and creating drafts and spouts of flame by their continuous hollow and combustible construction, it is a marked improvement now to use materials which cannot burn, and which therefore cannot assist in converting a small blaze into a conflagration. It has been repeatedly claimed that Elevator E, the larger of the two original structures, would have withstood the exposure to the surrounding fire had it not been for its connection by the conveyor galleries with the rest of the construction (wharf-sheds and freight-houses). It is true that the galleries next the elevator were equipped with "Grinnell" sprinklers, but in the fierce fire and the strong drafts accompanying it the conveyor served as a flue to bridge over all petty obstructions, and the main elevator was finally burned, after withstanding the heat for some time.

The original Elevator E was also one of the better style of wooden elevators on a pile foundation with concreted basement, piers and foundation walls, heavy timber posts and cribbed bins. It had seven receiving and seven shipping legs and a complete set of spouts, conveyor belts, etc., to receive and store 1,500,000 bushels of grain, and to deliver the same to the wharf for loading vessels by four belts, conveyor galleries, etc. It was covered with corrugated galvanized iron. It had a completed dust-collecting apparatus, sending the sweepings to the boilers, and it had a separate brick power house in which were installed compound steam engines for operating the elevators and also for electric lighting; and also powerful pumps. It had two water tanks on the roof

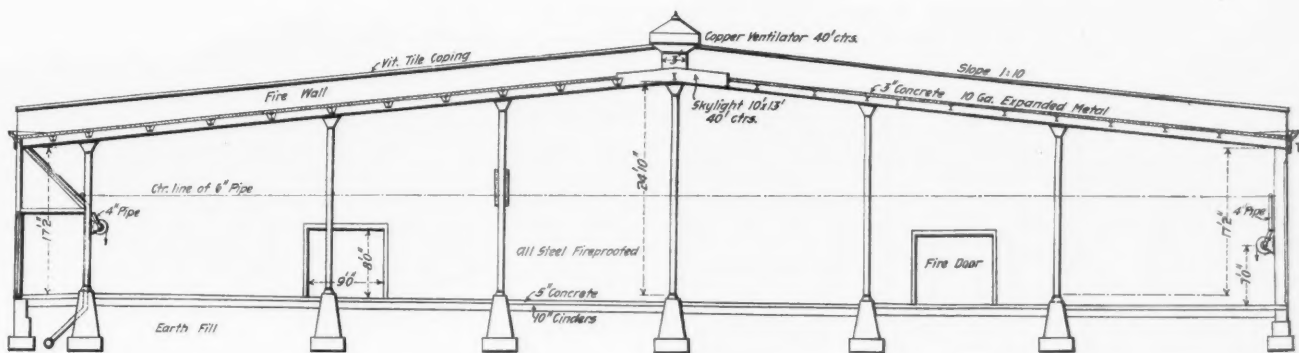


Laying Concrete Slab Roof on Freight House.

avenue along the left bank of the Mississippi river, being about 4,850 ft. long. It was built in three parts, about 2,100 ft. next to Louisiana avenue being built in 1895, the 1,500 ft. next up-stream, in 1898, and the rest in 1903. The earliest portion was made but



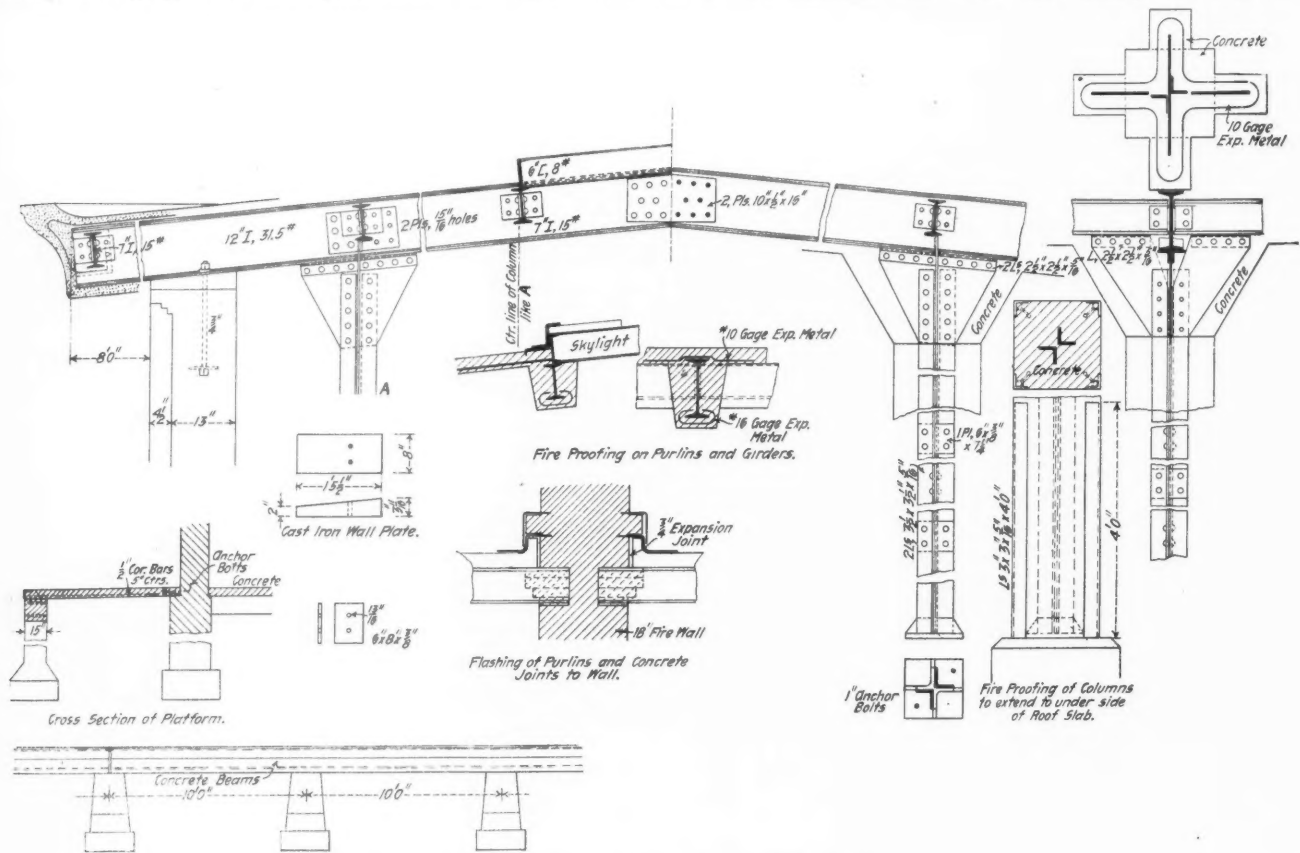
Plan of Stuyvesant Docks Showing Old and New Fire Mains and Hydrants in Buildings and Yards.



Typical Cross-Section of Cotton Warehouse, Large End.

100 ft. wide and was intended to carry locomotives and trains, and hence had some piles 5 ft. center to center for certain tracks. The wharf was not covered at first with any roof. As the railroad company came to use it they found it best not to run locomotives on it, and that even more space would be needed for storage, and, finally, that storage room was needed rather than tracks on the

acter might have been made but it was decided not to take any chances of storing valuable merchandise under a leaky or uncertain roof and the decision to build a complete three-ply roof followed as a matter of course. This, though costing three to four times as much as a single composition coating, will in the long run be more economical than to pay heavy damages for injury to



Details of Fireproof Roof and Floor Construction in Freight House.

wharf; so that in adding further to the original wharf, a width of 150 ft. was adopted as standard and the old wharf was widened to that size at the up-stream end next to the added wharf. Also the river front was relined, making an addition of 30 ft. at the down-stream end and building up-stream on a long curve for future increases. At the same time sheds were built over old and new portions, thus fitting them for great storehouses for lumber, staves, cotton, etc., in transit from cars to vessels, or vice versa. The earlier wharf was built of untreated yellow pine piles and timber, the second addition of cypress piles and timber, while the third front was made of creosoted piles (or where piles were spliced those parts exposed above water were treated), caps, floor-joists and braces, while the floor planks were untreated yellow pine. The material of the wharf shed, conveyors, etc., was also untreated except by painting with a fire-proofing composition. All but 500 or 600 ft. of this wharf, together with its shed and roof, was burned, a shift of wind permitting the saving of a small portion.

This has been replaced by a creosoted pile wharf, piles generally spaced 10 ft. center to center each way; piles full length up to say 65 ft., but spliced to 95 ft. or more in the front rows, the top pieces only being creosoted. Pile caps and floor joists and braces are also of creosoted yellow pine, while the floor is of untreated yellow pine. Over this is a wharf shed of skeleton steel construction on which is placed a reinforced concrete roof. The posts supporting the roof are jacketed with concrete as shown in the accompanying detail drawings. This roof is being made water-tight by building on it, in place, a three-ply composition felt roof. As the concrete on these roofs is $3\frac{3}{4}$ in. thick and is well reinforced with steel, it was thought that a waterproof covering of less expensive character might have sufficed. Several proposals were made, and the attempt to use a single coat of tar or asphaltic composition for this covering was tried, special pains being taken to see that all fine cracks in the concrete work were either avoided, or if made at first, that they should be filled with fresh mortar and made essentially tight before the application of the bituminous coat; but in spite of all efforts, a few days sufficed either to open the old cracks or to produce new ones, and a single coat would not shed the water. Possibly under the best conditions and with most careful workmanship, a water-tight coating of this inexpensive char-

acter might have been made but it was decided not to take any chances of storing valuable merchandise under a leaky or uncertain roof and the decision to build a complete three-ply roof followed as a matter of course. This, though costing three to four times as much as a single composition coating, will in the long run be more economical than to pay heavy damages for injury to



Rebuilding Elevator "D."

acter might have been made but it was decided not to take any chances of storing valuable merchandise under a leaky or uncertain roof and the decision to build a complete three-ply roof followed as a matter of course. This, though costing three to four times as much as a single composition coating, will in the long run be more economical than to pay heavy damages for injury to

The freight houses are two in number, each 100 ft. wide be-

tween walls. No. 1 is 1,200 and No. 2 1,000 ft. long. As previously stated, the foundations of these were uninjured by the fire, but the posts, roofs and adjacent platforms were entirely destroyed, and the brick work of the outer walls and the partitions, or fire-walls, were so badly damaged that the only thing to do was to clear away everything nearly or quite to the level of the floors, and rebuild above that elevation. In rebuilding these houses opportunity was taken to make them entirely fireproof, no wood at all being used except for the usual wooden, metal-covered sliding fire doors, which are accepted by the insurance authorities as preferable even to double sheet-iron doors. The wooden posts formerly supporting the roof are replaced by steel, jacketed with concrete, and steel beams, channels, plates and angles are used instead of wooden purlins, rafters and joists. Reinforced concrete slabs take the place of wooden sheeting to make the surface of the roof. The platforms around the freight houses are made of concrete as well as the projecting roofs over them, using no wood at all. Here again, as in the case of the wharf sheds, it was finally decided to put a three-ply composition roofing upon the concrete base to make a watertight roof, not trusting to concrete, or mortar, or a single coat of composition, though all were experimented with. The attempt was made to get responsible roofing contractors to make such specifications as their experience might suggest, and to propose to put on a covering according to these specifications, giving a written guarantee to maintain a tight roof for three, five, or ten years, but no one was found willing to do this unless the specification was made to cover the construction of a roof laid in three or more thicknesses of felt, cemented by the usual composition coatings, built in place on top of the concrete. They all doubted the concrete, fearing it would crack and tear open, so that a single or a light covering could not be effective. One or two said that if they had done the concrete work they might possibly guarantee a single coat or covering to be effective, but as the concrete was done or was all under contract, no combination contract could then be let to cover the joint work. The roofing contractors were willing to put on anything the railroad company wished, but only at the cost and also at the risk of the railroad company, and in no case at contractor's risk. This settled the question in this case, but it might be valuable experience to attempt cheaper work under more favorable conditions. The writer believes it will be so done in the near future.

It is true that the structural steel deflects under the normal loading so as to create a tendency to crack the upper surfaces of the concrete slabs on the tops of both purlins and rafters at the points where tension is brought in the upper surfaces of the concrete. Can this be sufficiently resisted, say by the proper use of expanded metal of small mesh? And if so, and if the cracking is merely of a minute or microscopic character, will not a single coat of plastic composition be all that is needed to make a water-tight job? The writer understands that the use of such a meshed reinforcement should and would limit the cracking to such fine lines that it may alone, without any plastic covering, be impervious to water, and some tests which have been made tend to confirm this opinion. Of course, if the cracks are not very small, and if they open and shut under varying loads, such as wind, etc., the water will work through, and a concrete roof will be a leaky one. The question is, how much paint, pitch or asphalt is needed to stop the cracks, if there must be any; and must there be cracks, if we reinforce the concrete properly? This is a field for experiment and for careful work, and should be a profitable one for him who investigates it thoroughly.

There was a cotton warehouse in the original plant, about 1,400 ft. long and from 80 to 130 ft. wide, one story high, with railroad tracks on one side and a street on the other, the floor at about the level of a car floor, divided into sections for the storage of cotton and transfer from teams to cars. This was a wooden building and was totally destroyed. It is replaced by a longer building of fireproof construction, concrete foundations and floors, brick walls, steel posts, and reinforced concrete roof, which will be covered by a three-ply composition roof. This is fully explained by the plans and photographic views. The general plan is here carried out, as in the freight houses, of using no wood except for doors, and these are covered with metal as required by insurance rules. The building is divided into sections about 240 ft. long each, and doors are limited to a minimum number. There are no windows, and transoms are of iron, set with wire glass. The floor is at the level of car floors on the side of the building next to the track, and is about the height of a truck on the street side,

and has a slope from side to side, varying with the width of the house. This structure extends from Louisiana avenue to General Taylor street, about 2,200 ft., and occupies all of the available width between Tchoupitoulas and Water streets, covering an area of $6\frac{1}{2}$ acres. It is a vast improvement over the original temporary, combustible building which it replaces. It is the theory that should a fire occur in either the cotton warehouse or in one of the near freight houses, it could be confined to the particular section (120 ft. long in freight houses and 240 ft. long in cotton warehouse) in which it was located and might burn out there without extending to an adjacent section. Of course, the actual working of this theory cannot well be tested, but this shows the aim of the plans and it is believed that a long stride has been made towards the cutting down of fire risk.

To act as auxiliaries in putting out a fire, the old system of pumps, tanks, pipes and hydrants has been enlarged and made more convenient of operation. The general plan herewith



Freight House, Roof and Posts.

shows numerous details of these features. From this it may be seen that there are three pumping plants. One set is an independent pumping station near the east end of freight house No. 1 and southeast of Elevator D. This draws water directly from the river through three 14-in. suction, but is also cross-connected to the large 100,000 gal. supply tanks near the two elevators and may be used to fill or draw from them, or to put pressure on the mains and hydrants by proper adjustment of the intermediate valves. There are also large pumps at each elevator power house, each having two 14-in. suction directly from the river, each of which may at will, by suitable setting of valves, be made to perform any desired pumping duty. Lines of water mains are laid as shown on the plan, the pipes being properly graduated in size to correspond to the groups of hydrants located on the whole property, which they are designed to supply. These hydrants are of various sizes, the smaller having two 2½-in. connections, others one 4-in. and two 2½-in., and others being "Niagara" hydrants throwing 2½ to 3 in. streams. There are 12 of the latter, each being on a raised iron framework 8 or 10 ft. above the ground, and placed at commanding positions where their streams may be most effective. The smaller hydrants are distributed throughout the property, some on the ground among the tracks, others regularly disposed on the wharf and in the freight and warehouses and on the roofs, each having near it an abundant supply of rubber-lined fire hose, with reels, nozzles, etc. The water mains are all located under or between the tracks so far as possible, thus avoiding a disastrous error in the old scheme, namely, placing mains on the wharf, where their use was soon stopped by the fire.

As a further defence against the spreading of fire, the wharf is cut up into eight sections by seven fire-walls, and each warehouse is similarly sectionized by fire-walls. In the wharf these have pile foundations, and concrete bases extend to or below low-water mark or into the permanent ground, and the upper walls are generally of brick, 18 in. thick, strengthened by pilasters at frequent intervals. In all cases the fire-walls extend well above the roofs, or project around the sides of buildings to perfect the cut-offs. Doorways through these are reduced to the smallest possible num-

ber, and each is arranged to close automatically by double doors made of three thicknesses of wood covered with sheet iron (or tin) tightly soldered, and fastenings operating automatically through fusible links melting at a dangerous rise of temperature.

Supplementing these arrangements, there will be installed a complete electric alarm system with bells, signals and calls, so that the exact location of an incipient fire may be announced, and with the men trained to a properly devised fire drill, it is expected to put out a blaze instantly and before it may assume dangerous proportions. Such a drill was in practical use at the time of the fire, but as it occurred on Sunday evening, the force at hand was too small to be effective.

It is hoped that the provisions above described may suffice to prevent the recurrence of such a calamity as that of last February. While there are undoubtedly many further precautions and refinements of construction that might be effective to avoid or extinguish fires, there is always the question of cost; and the true meaning between extravagance and parsimony can be reached only by continued trials.

The work of rebuilding the Stuyvesant Docks has been handled by the bridge department of the Illinois Central, Mr. R. E. Gaut, Engineer of Bridges, and Mr. W. S. Greenfield, Resident Engineer at New Orleans. While some of the work has been done directly by the railroad company's men, the general work has been contracted to Geo. B. Swift Company and to James Stewart & Co., the former of Chicago, the latter of St. Louis. The work not being complete, no statement of cost can be made, but the estimate runs but little short of \$2,000,000 to restore the whole work to first-class shape.

The Industrial Department.

The recent appointment by the North Eastern Railway of England of a Commercial Agent, a new officer in English railway organization, whose duties correspond with those of an American railroad Industrial Commissioner, leads to a review of the history of the railroad industrial department.

The first American railroad industrial department was established on Jan. 1, 1891, by the Chicago, Milwaukee & St. Paul, when Mr. Luis Jackson, now Industrial Commissioner of the Erie Railroad, began the organization of the St. Paul's industrial department, at whose head he remained for over 12 years. The idea of securing eastern manufacturers for western territory had earlier occurred to Mr. P. S. Eustis, then General Passenger Agent, now Passenger Traffic Manager of the Chicago, Burlington & Quincy, suggested by the establishment of a branch factory of a New England manufacturing concern at Aurora, Ill. It seemed probable that if advantages of a change of location were made clear to them other eastern manufacturers might be attracted to the west. Mr. Jackson, who had had training in the traffic department, was commissioned by Mr. Eustis to look into the possibilities of Burlington territory, with the words: "You get data on the possibilities. We have no instructions to give." As a result of his examination, circulars and pamphlets descriptive of Burlington territory were prepared and given a large and continued circulation, as many as 4,000,000 being eventually sent out. In the preparation of these circulars and examination of the possibilities of the territory the fuller idea of a department of railroading which should give its attention to commercial economy in relation to manufacturing was developed.

Mr. E. P. Ripley, now President of the Atchison, Topeka & Santa Fe, was at that time General Manager of the Chicago, Burlington & Quincy. It was after he became Third Vice-President of the Chicago, Milwaukee & St. Paul that the industrial department, with Mr. Jackson as Industrial Commissioner, was established. St. Paul territory was at once districted by resources, advantages and markets. Economic data was collected and put into print and railroad industrial advertising was for the first time begun. Hemlock bark resources on the line were made known through tannery papers in order to attract tanneries; water power and wood pulp, through paper mill journals; clays, through brick papers, and, in this way, a variety of industries were specially advertised by circulars and in trade and Eastern newspapers. Maps of the territory reached by the railroads were distributed, covering the location of particular resources and containing facts of interest to some particular class of manufacturers. One of these showed the location of the Lake Superior iron ore ranges and proved very popular among iron and steel manufacturers all over the country. Another was issued to promote the Wisconsin tobacco industry. It showed, shaded in brown, the areas in Wisconsin where tobacco was already being raised with profit, and at the same time showed the areas still open to profitable tobacco production. A copy of this map was sent to every post office, creamery and saloon in the counties available for tobacco culture. As a result, tobacco raising in those counties tremendously increased and considerable areas where none was grown before began to cultivate tobacco. The American Tobacco Company now employs hundreds of people during a third of the year in sorting tobacco in this part of St. Paul territory. To the

Chicago, Milwaukee & St. Paul belongs the credit of being the first railroad company to adopt active measures of this sort to call the attention of manufacturers to the specific advantages of its territory.

Many mistaken ideas were prevalent when this first industrial department was started. It was thought, for instance, that its main endeavor would be to get factories to remove from one railroad to another, the railroad in that case acting merely as a real estate agent. This idea was promptly knocked on the head by the advertised announcement that the St. Paul road was not trying to get factories to remove from one part of the west to another.

In general, a railroad industrial department is not interested in getting manufacturing plants to change their base except in those cases where they are, economically speaking, wrongly located. Economic changes are constantly going on, and there are many factories which were established 40 or 50 years ago which have either outgrown available facilities or are now economically badly located in relation to sources of raw material or markets for finished products. The correct economic location of a steel works is no longer, as in earlier days, along the Atlantic ocean; but in the Buffalo, Youngstown, Cleveland, Pittsburg, or Chicago or Birmingham districts, where ore, coal and coke are conveniently available. Besides established manufacturing plants in need of more favorable locations there are always new companies going into business and new resources to develop, either through outside capital ignorant of the opportunities or by opening the eyes of local capital to local advantages.

The industrial department should not be considered to have developed from the land and immigration department, although of late years many land and immigration departments have gone into the business of endeavoring to secure industries, and the titles of several have been changed to land, immigration and industrial department, or to land and industrial department, or to immigration and industrial department. The Chicago, Milwaukee & St. Paul had an immigration bureau for 30 years before its industrial department was started. Nearly every western road had an immigration bureau and many land and immigration bureaus, but no road had an industrial department before 1891. The distinction is similar to that between the United States Department of Agriculture and the more recently created Department of Commerce and Labor. It is quite possible on railroads which run through agricultural rather than manufacturing territory to work the land, immigration and industrial departments together, but in such cases the industrial side of the department is likely to be subordinated to its land and immigration activities. This is natural enough, for obviously a territory must be well settled and cultivated before anything in the way of manufacturing can be expected to develop. The straight-out industrial department deals with manufactures and aims primarily to develop raw materials and other resources as a basis for the location in its territory of profitable manufacturing industries.

Since the establishment of the first industrial department by the St. Paul in 1891, many other railroads have established similar departments or extended their land or immigration departments to cover the establishment of industries. In the east, the Erie, Lehigh Valley, New York Central, Delaware & Hudson, Baltimore & Ohio and Seaboard Air Line have industrial departments; the Delaware, Lackawanna & Western an industrial and advertising department, the Southern a land and industrial department, and the Louisville & Nashville an immigration and industrial department.

West of Chicago, the Illinois Central, Burlington and Wisconsin Central soon followed the example of the St. Paul in establishing an industrial department. The Atchison, Topeka & Santa Fe, Chicago & Alton, Chicago & Eastern Illinois, Great Northern, Missouri Pacific and St. Louis & San Francisco also have Industrial Agents or Commissioners. The Chicago & North-Western's industrial department is the most lately established, and on January 1 a similar department is to be established by the Wabash. Most of these roads have a separate land or immigration department. The Minneapolis, St. Paul & Sault Ste. Marie has a Town Site and Industrial Agent, and the head of the Wisconsin Central's department has the title of Land and Industrial Commissioner.

This incomplete list shows the spread of the original railroad industrial idea. Yet in spite of this development, this is perhaps one of the least generally known railroad departments, and, furthermore, is probably not what most people think it is. It is not easy to bring into a definition its object and duties.

The following extract from a publication of the Santa Fe gives in concrete form an idea of the purposes of that company's industrial department:

"To ascertain and bring to the attention of interested manufacturers all resources of new materials along the lines.

"To co-operate with and encourage the citizens of its territory in the establishment of industries which local conditions, markets or other conditions favor.

"To bring opportunities for investment in its tributary territory to the attention of investors.

"To aid producers along its lines to extend their markets and to foster an interchange of commodities along its system.

"To encourage and aid in the introduction of new and profitable products.

"To keep in touch with developments and discoveries in its mineral territory and to aid miners and prospectors in bringing their claims to the attention of capital."

It will be seen from this description that the industrial department is a sort of information bureau, also a "facilitating" bureau. A large department force is not required, the average being three or four men. But its work and methods presuppose the active co-operation of all other departments. The primary object is, of course, the creation of traffic, and the head of the department must be thoroughly versed in traffic matters, education in this department being perhaps the best training for the position. The Industrial Commissioner reports to the Freight Traffic Manager or to the President direct.

A very large part of the work of the department is to ascertain and bring to the attention of interested manufacturers resources of raw materials along its railroad's lines. On the Santa Fe system there are countless examples in which manufacturing plants have been located as a direct result of the efforts of the industrial department. As concrete examples, may be cited Portland cement, glass and brick works in Kansas, and the beet sugar industry in Colorado. To this department on the Santa Fe belongs the credit for first demonstrating the practicability of beet sugar production in Colorado, of interesting capital for building the first plant and of nurturing and encouraging the industry since that time. Experiences with the other three industries mentioned were of a similar nature, all of which now contribute a profitable traffic not only to the Santa Fe but to other roads as well.

Another feature of the work of the department, and one for which too much credit cannot be given, is in actively aiding in the scientific investigation and development of any newly discovered material, product, or process which gives promise of being of commercial value. An example of this is a weed or plant growing in the West from which it has been thought rubber could be obtained. The matter was taken up with the Department of Agriculture at Washington, and also at the same time the interest of rubber manufacturers was enlisted. This investigation, which is still under way, may yield important results, or, on the other hand, may prove of no practical value whatever and be abandoned. It is sometimes the case that the department may work several years on such an experiment, or in getting the first industry of its kind established in a new field; that is, the difficulty is to find the man or concern in that line looking for a change or for enlargement, willing to put money into the venture.

The department keeps closely in touch with commercial bodies in all towns on the system, the head knowing personally the secretaries of these organizations. Some departments will investigate for these associations any industrial concern which wishes to come to town, or which they may be trying to induce to come to town, and if found to be all right, encouragement is offered and all assistance at the department's command tendered. Acquaintance with the banks in every town is an item of the department's assets, for this makes it possible for a concern in need of a bank's assistance in getting established to more readily obtain aid through the recommendation of the department, although the latter assumes no responsibility in the matter.

Its head must be familiar with every condition affecting the welfare of the system, be it condition of crops or live stock, the volume and direction of various exports, or what not; in fact, about one-fifth of its efforts are directed to the collection of information. It is a bureau of information for the other departments and is expected to be able instantly to supply any industrial information desired. One valuable source of information is the station agents, with whom the department keeps closely in touch and uses to the fullest extent.

An industrial department in the West is actively and materially interested in the matter of irrigation, being desirous of having started all of the irrigation work possible. It co-operates with the Government in this work. It also co-operates actively with the Department of Agriculture, and with State boards in the dissemination of knowledge about land and what it will grow best.

A concrete example will make clear its work of "facilitating." A man desired to enlist the interest of a certain road in a project which had to be referred to the President for final decision. This man did not know how to go to work to get it through promptly and undoubtedly would have encountered difficulties in bringing it intelligently to the President's attention. By submitting the situation to the Industrial Commissioner, the latter obtained in quick time from various departments of the road the necessary information and had the case ready in suitable form for the President's attention, in a very short time. It must always be borne in mind that the department directs its efforts mostly to getting things started, to bringing the right people together. Details are left to the proper men and departments of the road directly interested, the industrial

department, however, keeping track of developments and giving all possible suggestions and assistance from its own knowledge and experience.

The publications of the industrial department are part of the general scheme of industrial development of the railroad's territory. Similar in idea to the iron ore or tobacco maps of St. Paul territory already described, though more comprehensive than either is the industrial map published this year by the Erie Railroad. This shows in colors the bituminous and anthracite coal areas, the oil and gas areas and those which include coal, oil and gas, along the Erie lines. This map was made from charts of the United States geological survey, and on account of its accuracy has had a large general use throughout Erie territory. Annually a pamphlet is issued containing a list of new manufacturing plants located during the year on the Erie and photographs of some of the most important new plants in process of construction. This is really a results-summary of the work of the department during the year. Circulars for special industries include one giving a list of the limestone, bluestone and sandstone quarries and another showing the location of lumber in the log in commercial quantities in Erie territory.

The land and industrial department of the Southern Railway publishes a monthly newspaper called "The Southern Field," devoted to the agricultural, manufacturing, mining and business interests of the country tributary to its lines. Through detailed descriptions of the advantages of the territory in relation to some particular industry and photographs of actual forests, mines, orchards and products, opportunities are brought directly before a wide range of possible homeseekers, investors and manufacturers. The Southern also, through district agents of the industrial department, local real estate agents and the station agents along the line, keeps in close touch with possibilities and industrial progress. From information given by men on the ground, the department comes into possession of a mass of information of the very greatest value in the intelligent and successful carrying out of its duties. Water powers, new industries established or additions to existing industries, land sales by local real estate agents, purchasers of farms, good roads' development, timber and mineral lands existing and for sale, number of and new banks, churches, schools, academies and colleges in each locality, municipal government or the lack of it, boards of trade, municipal and public improvements, Northern and Western people recently located, farms for sale, new industries proposed and real estate sold are some of the facts of which the department keeps a record. Some of these inquiries are made monthly. Thus there is on file at the central office a complete industrial record of the territory.

On publications of roads like the Chicago & North-Western, which are constantly opening up new territory to the westward, the immigration idea is generally most strongly urged. "New Homes in the West" is the title of one of these circulars issued to attract homeseekers to new territory soon to be thrown open to settlement. This road also publishes lists of industrial opportunities and business openings on its lines. These go into detail as to the kind of business and where it is needed. They also include a list of factory buildings for sale.

The Wisconsin Central issues circulars on the dairy industry in Wisconsin, land drainage, the hay crop, "Timber Propositions As We See Them," and "Wisconsin and Its Opportunities," the latter including a soil map and many photographs of Wisconsin farms and products.

The Baltimore & Ohio some time ago issued a book entitled "Industrial Opportunities," containing descriptions of mineral lands, analyses of ore and of limestone, locations of deposits of sand, clay and stone, farm and fruit lands, factory sites and special inducements offered by towns along its line. The Lehigh Valley has a similar book in press. These examples cover pretty fully the typical publications of a railroad industrial department.

Although the industrial department is numerically a small one, it is easy to see how important its activities are to the prosperity of its railroad. To develop the territory industrially, to bring capital and opportunities together, to increase the number of manufacturing plants on the line, to extend the use and commercial development of natural resources and bring about the greatest possible growth and prosperity of its towns and cities are all matters of vital importance to a railroad's traffic, which means to a railroad's prosperity. On the modern railroad industrial department depends very largely the success of these measures.

Foreign Railroad Notes.

St. Petersburg newspapers published during the railroad strike say that however blamable the conduct of the railroad men was, nevertheless it could hardly be expected that they could longer endure the treatment they have been receiving without some violent expression of their dissatisfaction. They made known their discontent last February, and it was generally acknowledged that their pay was shamefully insufficient, and their other complaints well founded; yet in the estimates recently presented for next

year's expenditures no provision was made for bettering their condition. Under these circumstances they have easily and very generally been converted to the wildest revolutionary doctrines.

A Swiss life insurance company has agreed to insure members of a railroad men's temperance society for 4 per cent. less than the premiums charged to non-members; and a Swiss accident insurance company which for some time has made a rebate of 10 per cent. to total abstainers is so well satisfied with the result that it will make the rebate 15 per cent. after 1905.

Washington Correspondence.

WASHINGTON, December 19.—The most important railroad legislation development of the past week was the introduction to-day of the bill prepared by Senator Dolliver, of Iowa, proposing to empower the Interstate Commerce Commission to fix maximum rates. Senator Dolliver is looked upon as the most extreme advocate of governmental rate making on the Republican side of the Senate Committee on Interstate and Foreign Commerce, and additional significance is given to his bill by the indications that it probably embodies the exact ideas of the President more nearly than any other measure that has yet been brought forward. The President has let it be known that he will not openly endorse any particular rate bill as an administration measure, and Senator Dolliver does not represent that his bill has received the Presidential approval. The idea that it is to be regarded as the administration bill is based on the fact that Senator Dolliver has been in frequent consultation with President Roosevelt and Attorney-General Moody on the subject of railroad legislation. The latest of these conferences took place at the White House last night, when there was also present former Judge Cowan, of Texas, one of the men most prominently associated with Mr. E. P. Bacon, of Milwaukee, in his campaign for enlarging the powers of the Interstate Commerce Commission. Prior to this conference Mr. Dolliver had had a few copies of his bill printed, and the idea that it is an administration measure has been strengthened by the fact that when he introduced it to-day he had made several very important changes in the printed text, presumably as a result of the criticism of the President and the Attorney-General.

In the main, Senator Dolliver followed the general plan of the bill prepared by the Interstate Commerce Commission, but he departed from it in several important particulars. While both the Commission bill and the new Esch-Townsend bill propose to empower the Commission to prescribe both maximum and minimum rates, the Dolliver bill would restrict it to the making of maximum rates. The Commission bill proposes to empower the Commission "to determine what will be a just, fairly remunerative, and reasonable rate." The Dolliver bill would have it "determine and prescribe what will, in its judgment, be a just and reasonable maximum rate." The words "in its judgment" were inserted by Mr. Dolliver, and the words "fairly remunerative" were stricken out by him after the conference of last night. Both changes are being subjected to criticism. It is contended by critics of this bill that the proposition to expressly authorize the Commission to fix rates in accordance with its judgment is a direct proposition to confer upon that body discretionary legislative power and would be unconstitutional for the reason that it does not contemplate the making of rates in accordance with a standard prescribed by the judgment of Congress but in accordance with the judgment of the Commission. The effect of striking out the words "fairly remunerative" it is contended would be to attempt to preclude the Commission from taking into consideration, in determining the justness of a rate, all question as to whether it would yield a fair return upon the capital invested in the railroad or not. Taking these two changes together, it will be seen that the Dolliver bill proposes to give the Commission more absolute power over rates and, through the rates, over railroad property, than any other bill that has yet been proposed for the fixing of maximum rates.

In addition to eliminating the provision in the Commission bill for the fixing of minimum rates, Senator Dolliver also struck out, after the White House conference, a provision that he had inserted to empower the Commission to "determine and prescribe the just and reasonable relation of rates," intended to empower the Commission to fix minimum rates and prescribe differentials without expressly saying so.

The Dolliver bill differs from the Commission bill, and from the new Esch-Townsend bill, in proposing to retain the existing law as to the length of notice required for the raising or lowering of a published rate, with the addition of a provision permitting the Commission to allow changes on less than the notice specified and to modify the requirements as to the publishing and filing of tariffs, either in particular instances or by a general order.

The provisions of the Dolliver bill for the judicial review of the orders of the Commission differ very much in form from the corresponding provisions of the Commission bill, but it is contended by critics of the Dolliver bill that its effect would be practically the same and that the court of review would be limited to the considera-

tion of the single question whether the new rate ordered by the Commission was one that could or could not be constitutionally prescribed by the legislative branch of the government. It is contended that an order of the Commission made under the provisions of this bill could only be set aside on the ground that the rate made was so low as to amount to the confiscation of the property of the railroad.

It is not yet clear whether the House or the Senate will be the first body to act upon railroad legislation, but the action of the House will be considered as of relatively little importance. It is recognized that the real battle is to be fought out in the Senate. The generally prevailing opinion is that a compromise will be agreed upon finally that will give the Commission authority to make rates in some form, but it is clear that such a compromise will be adopted only after a very hard fight. Senator Foraker, of Ohio, will take the lead in the Interstate Commerce Committee and in the Senate in opposing any such compromise. He is even more strongly opposed to giving the Commission the rate-making power in any form than are most of the officials of the railroads. His opposition is based on the ground that conferring this enormous power on a political administrative body would be a dangerous departure from the fundamental principles on which the government of the United States is founded and that it is possible to provide for the effective and speedy correction of every unreasonable rate and every railroad abuse through the courts of the United States without resorting to a measure that he would regard as little short of revolutionary.

J. C. W.

The Charing Cross Roof Failure.

Engineering in its issue of December 8 gives some meagre facts about the collapse of part of the train shed roof of the Charing Cross Station, London, which occurred on December 5 and killed and injured a number of persons on the platforms underneath. The information available seems to effectually refute the theory advanced that the cause of the failure was the weakened condition of the truss members resulting from the corrosive action of the gases rising from locomotives to which the structure has been exposed for 45 years. The train shed was built in 1860 from the designs of Sir John Hawkshaw. The roof structure consists of braced arches of 130 ft. 6 in. span with a rise of 45 ft. spaced 35 center to center and carried on brick side walls. Between the arches the glass roof is carried by 18 latticed purlins, 1 ft. 7½ in. deep, which support light T-iron frames in which the glass is bedded. The arch rib of the main trusses consists of a single plate 18 in. x ½ in. with 6-in. x 3-in. x ½-in. angles. The bracing truss consists of struts and diagonals made up of two 6-in. x 3-in. x ½-in. angles and bottom tie rods of round iron varying from 4¾ in. to 4½ in. in diameter. No member of the main trusses is less than ½ in. thick and all members are wrought iron, of supposedly good quality. The structure has been painted from time to time as it seemed to require it, and there were no superficial evidences of weakness at the time of the failure. The arches are fixed in the masonry at one end and carried by a suspended link at the other and not on roller bearings. The end truss and the one next to it fell at the time of the collapse. The first fracture is said to have taken place in one of the tie bars of the second truss about one-quarter of the way out from the west wall, and the loud snap of this member gave warning to several men below who escaped. This tie bar was originally 4¾ in. in diameter. There was no wind at the time the accident happened or any load on the roof other than the normal dead load. Assuming that the arches were designed with a factor of safety of 3, the reduction of effective cross-sectional area in the tie rod to account for the failure would correspond to a reduction in diameter of nearly 2 in. Of course, some other members of the truss may have wasted away under corrosive action and thrown an exceptional stress on the tie bar which failed, but this is doubtful. That vague, but well-known phenomenon, fatigue of metal, is a much more likely explanation of the failure than corrosion. It usually occurs under just such circumstances as this, minimum load and no apparent preliminary signs of fracture. There is one strong lesson to be learned from this accident. Engineers must not put too much faith in the quality and strength and endurance under heavy loads of steel and iron. The factor of safety should be taken high enough to prevent overloading with resultant fatigue. A saving of a few pounds of metal in the beginning is not balanced by the collapse of the structure many years later when the overloaded members give way and break without warning. The engineers of years ago knew little or nothing about fatigue of metals. Since the experiments of Wöhler, Spangenberg, Thurston and others, the theory has become generally accepted but too frequently neglected. If within the next few years other structures of this kind and age fail under similar circumstances then it will be time to look carefully into the condition of all the more modern structures. We know comparatively little about the subject and to be on the safe side should follow the axiom of whist players, "When in doubt play trumps." As for corrosion we need worry but little. It is what takes place inside the metal that is uncertain. The outside shows for itself.

General Herman Haupt.

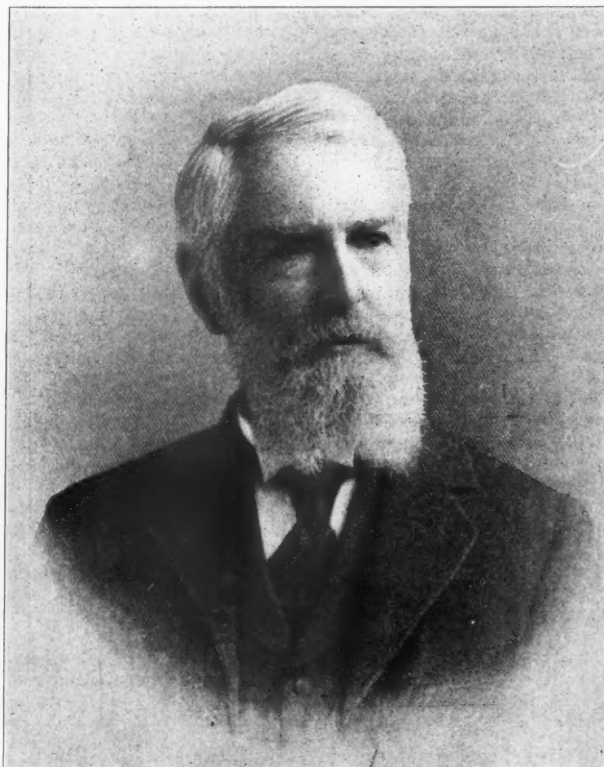
The death of this distinguished engineer, whose life has covered the development of the railroad epoch of this and other countries, occurred on the morning of December 14, while returning, with his son, from New York to Washington, where he resided. A long career so full of experience is of great interest, for through his fertility of resource great problems in the art of transportation have been solved.

General Haupt was born in Philadelphia on March 26, 1817. His father died when he was but 12 years old and left a widow with a family of seven children to be cared for. There were no free schools so that the youth earned his tuition by mending quill pens and caring for the fire in winter. At the early age of 13 he received an appointment from President Andrew Jackson to the Military Academy. He entered the next year and graduated in 1835. He was one of the youngest to enter the army and was the senior alumnus at the time of his death. In 1838 he married Ann Cecilia Keller, the daughter of the Lutheran pastor at Gettysburg, where he established a seminary for boys and subsequently for girls, until elected Professor of Mathematics in Pennsylvania College in 1844, which position he held until called to revise the location of the Middle division of the Pennsylvania from Harrisburg, Pa., to Altoona, in 1847. Prior to this he had been engaged on the Norristown & Valle Railroad under Henry R. Campbell, in 1835, and the next year, although only 19, he was appointed Assistant Engineer in the state service and located the line from Gettysburg to the Potomac, across the South Mountain, which is now a part of the Western Maryland. Thus it was he met his wife, and they gave to the world 11 children, of whom seven are still living. In 1840, he was engaged on the York & Wrightsville, and here he began the investigation of the strength of the old lattice trusses leading up to his first essay entitled "Hints on Bridge Construction," which provoked much discussion and led to the more elaborate work published by the Appletons in 1851, which soon became the standard work on the science of bridge construction. In 1848 he was made Principal Assistant to J. Edgar Thomson, and on the opening of the division he was placed in charge as Superintendent and prepared the system which has served as the basis for the magnificent development of the road. In the annual report of 1853, Mr. Haupt said: "To secure a traffic of 1,000,000 tons and make the road an instrument of incalculable good to the citizens of the state, low rates with moderate dividends, must indicate the settled policy upon which the operations are to be conducted." This was at a time when the possibility of so great a tonnage was thought to be Utopian.

Under his supervision as Chief Engineer, the entire road was opened to Pittsburg, and, in 1855, he was asked to act as Consulting Engineer for the Hoosac Tunnel. He soon discovered that to make it a success it would be necessary to surrender his important interests in Pennsylvania and give his undivided attention to the great problem of connecting the seaboard of the eastern states with the granaries of the West by penetrating the mountain by a five mile tunnel. This required the complete reorganization and financing of a project then unprecedented in magnitude, and which was violently opposed by rival interests. This work was successfully inaugurated and was progressing satisfactorily when the civil war and a change of administration called for the services of a man of experience and integrity to maintain the communications with the armies in the field. He was appointed, by President Lincoln, Chief of the Bureau of Military Railroads, and he organized construction corps and systems for the rapid destruction or construction of railroads and bridges, as necessity demanded. His achievements were great because of the incredibly short time required to restore interrupted communications and this system made

Sherman's march to the sea a possibility. He foresaw and correctly interpreted General Lee's strategic movement after Meade had relieved Hooker as Commander of the Army of the Potomac, and by early information and rapid movements succeeded in having the position at Gettysburg, with which he was so familiar, held and made impregnable. It is said that if his urgent entreaties had been heeded, the defeated army could not have escaped to Virginia and the war would have been ended at once. Tirelessly, by day or night, without consideration of personal comfort or necessities, he perfected his bureau and its personnel and the opening up of communications with the front so that he was early offered a commission as Brigadier General "for faithful and meritorious services."

The Hoosac tunnel exigencies required more rapid work than was possible by hand labor and led to the invention and successful introduction of his portable, percussion drills, afterwards so successfully used in the great European tunnels through the Alps, under the name of the McKean Rock Drill. Another of Haupt's achievements was the securing of a continuous right-of-way for a pipe line from the oil regions to the seaboard, prior to the existence of any general laws, and the subsequent building of a line which reduced the cost of transportation on this important commodity from 40 to 4 cents a barrel. This was accomplished at a time when the independent producers could secure no sufficient railroad transportation. Since its success, general pipe-line laws have been passed and the system is now in extensive operation. Another of the impulses which this many-sided engineer gave to his profession and the world, was the practical introduction of compressed air for motors and mining machinery and for power, when transmitted long distances, under high potentials, from cheap water-power plants. In 1881 he was appointed General Manager of the Northern Pacific, which position he held until 1884, after the completion and opening of the line in the fall of 1883. He secured the great terminals, so necessary for the rapid handling and interchange of freight. His judgment was severely criticized when he urged the purchase of the Powelton estate, on the west bank of the Schuylkill, for the Pennsylvania road, at a time when it was thought to be wholly unnecessary, but this land to-day constitutes a small part of the present yards of that company. To facilitate the movement of freight at the western end of the State of Pennsylvania, he also designed a system of improvements in the Ohio river for the creation of a 6-ft. stage, at all seasons, which the river interests proposed



Herman Haupt

to construct at a cost of \$1,000,000 between Pittsburg and Wheeling, but the control of the works of this class by the Government prevented the project from being carried out, at the time. In 1879 he was also President of the U. S. Hydrogen Co., organized to generate and apply that element to metallurgical and heating purposes. He was actively interested in the Holly system of steam heating and the application of the physical sciences to the arts.

His later years have been spent in the evolution of a pure, cheap, and nutritious food from the waste products of the dairy, so that humanity might have a "well balanced ration," at a reasonable cost, which could be readily used and transported to all parts of the globe and be of service in the army, navy, at sea or on land, in homes or hospitals, in short, wherever pure milk is required, and which would keep for months without decomposition. It was in making a visit to the works of the National Nutrient Company in Jersey City that he was overtaken by the heart failure, which terminated so laudable a career.

His later years have been devoted to social, humane and scientific study and writing, and it was his purpose, if his life had been prolonged, to prepare a series of papers on these topics. At the solicitation of friends he has published in his "Memoirs" some of the principal events of the Civil War and

the system used by his corps in an illustrated subscription volume.

As a man General Haupt was unostentatious, domestic, loving, tender-hearted, upright in all his dealings with his fellow-men, having a keen sense of justice, righteousness and obligation to duty regardless of appearances, faithful to every trust, and in every act inspired by his strong faith in the brotherhood of man and the Fatherhood of God. His life has been an honor to his profession and a blessing to humanity. He was an instance of a man whom the Lord delighted to honor.

Interstate Commerce Commission's Annual Report.

Secretary Moseley has issued a synopsis of the Nineteenth Annual Report of the Interstate Commerce Commission, from which we extract the following paragraphs:

The Commission sets forth the general reasons for proposed amendments in the form of a bill, which has been submitted to the Senate Committee on Interstate Commerce in compliance with a request therefor. This bill has been abstracted in the *Railroad Gazette* (December 8, p. 529). The most important amendment is delegation of authority to the Commission to determine what rate should be substituted for the future in place of one found, after hearing, to be unlawful, with the further provision that the order of the Commission prescribing such substituted rate shall take effect within a reasonable time. The Commission recommends that the phrase "under common control, management or arrangement," in the first section of the law, be omitted. This would make the regulating statute apply to certain classes of carriers now exempt from its application and requirements. The definition of the term "transportation" should be enlarged so as to include the charges for various services, such as refrigeration and the like, which are now claimed to be beyond the authority of the Commission. The obligation to furnish and provide the services here referred to is also proposed, which is likewise a point now in dispute. For perishable commodities artificial refrigeration is necessary, and the ice is just as essential as the hauling of the car. The owner of the commodity transported cannot provide the refrigeration, and the consequences of an exorbitant icing charge are precisely as serious as the same kind of extortion would be in the transportation charge itself.

The furnishing of refrigeration is a part of the transportation itself, and the Commission recommends that these charges should be put on the same basis as all other freight charges, so far as they can be.

While the third section of the act to regulate commerce attempts to secure the interchange of traffic by connecting railways, carriers are now under no legal obligation to establish through routes or joint rates and may, at their pleasure, withdraw from such arrangements, thus defeating the purpose of the law. To prevent this the Commission should have authority to order railways to continue through routes and joint rates which are in effect and to prescribe divisions in case the carriers fail to agree, discriminations against individuals and against particular species of traffic can be effected by the refusal of a carrier to establish a joint rate.

By means of terminal roads, elevators and private cars, the carrier, by paying owners an extravagant sum for the service prefers him to other shippers of like property. This may happen in any case where the shipper is the owner of any of the facilities of transportation or performs any part of the transfer service. These methods are at the present time more or less resorted to with the effect of preferring one shipper to another. The Commission should be empowered in a case of this kind to determine whether the allowance to the property owner is a just and reasonable compensation for the service rendered, and to fix a limit which shall not be exceeded in the payment made therefor. Such a remedy would not be altogether adequate, and any remedy is extremely difficult of application, but nothing better appears to be available.

An efficient means of discovering illegal practices would be found in authority to prescribe the form in which books of accounts shall be kept by railways. This recommendation has been urged upon the attention of Congress in previous reports, and it is earnestly renewed at this time. Probably no one thing would go further than this toward the detection and punishment of rebates and kindred wrongdoing. Certain carriers now refuse to make the statistical returns required by the Commission. Admitting the right of a railway company to use its money as it sees fit, it is certainly proper that the Government should know what use is made of it, and whether the rates and charges imposed are legitimate. The Supreme Court has held that the Federal courts have no power to compel the making of these returns by mandamus, and the act itself imposes no penalty of consequence for failure to make the returns. The proposed bill provides a suitable penalty for unreasonable failure to make these returns and that the Federal courts shall have statutory authority to act by mandamus.

A new section is proposed to be added to the law to expressly authorize the Commission to review and modify its own decisions. The last paragraph of the new section limits the duration of an order of the Commission by providing that an order which has

been complied with for the period of one year shall not thereafter be in force as against the carrier so complying.

In 1903 and 1904 the Commission explained the Elkins law, and made favorable comments upon its operation; but further experience compels the Commission to modify in some degree those hopeful expectations. Various devices for evading the law have been brought into use, and the actual payment of rebates as such has been here and there resumed. Instances of this kind have been established by convincing proof, on which prosecutions have been commenced and are now pending. More frequently the unjust preference is brought about by methods which may escape the penalties of the law, but which plainly operate to defeat its purpose. While this does not imply any want of satisfaction with the act of 1903, which is regarded as a most admirable measure, nor any belief that there is a general return to former practices, it does mean that this type of evil has by no means disappeared and that it is liable to increase unless effectively restrained.

The Commission recommends that the accident report law of 1901 be amended so as to require that accidents of every kind and to all classes of persons shall be included in the monthly reports. Accidents could then be omitted in the annual reports.

The report shows 568 complaints filed with the Commission during the year, including both formal and informal proceedings; investigations on formal complaint, 65, involving the rates of 321 carriers. Seventy-nine hearings and investigations were held in Washington and other cities. Six cases were settled through concession of relief by the carriers and 22 cases were discontinued.

Forty-five formal decisions have been rendered during the year. This number, greater than in any previous year, includes cases of unreasonable rates, discrimination between localities, between commodities, and between persons and also in facilities of transportation, with some cases involving departure from published tariff rates and some relating chiefly to reparation. Nearly every kind of action prohibited by the regulating statute has been the subject of decision and order during the past year. Eleven of the cases are discussed in the report.

Proceedings for injunction under the Elkins act have been begun in the Santa Fe rebate case, the case against the Milwaukee Refrigerator Transit Company, and the Pabst Brewing Company and the Chesapeake & Ohio coal case.

Criminal indictments have been returned in the western district of Kentucky against Zorn, Williams and Bushfield, alleging acceptance of rebates. Samuel Weil, B. S. Cusey, V. D. Shipworth and C. E. Todd, of the Schwarzschild & Sulzberger Company, have been convicted for conspiring to obtain transportation at less than the published rates. The defendants were sentenced to pay fines amounting to \$25,000. Cases against the Western & Atlantic and against the Illinois Central and others based upon alleged pooling have been discontinued. The court decisions which have been rendered during the year, construing the act to regulate commerce, are briefly stated in the report.

STATISTICS.

The preliminary income report for the year ending June 30, 1905, includes returns for 752 companies, representing an operated mileage of 214,477.82 miles. The gross earnings of the railways on the mileage were \$2,073,177,325; passenger, \$572,109,366; freight, \$1,449,182,702; miscellaneous, \$51,885,257. Gross earnings from operation averaged \$9,666 per mile of line, which is higher than ever before. The final report for the year ending June 30, 1904, showed total gross earnings of \$1,975,174,091, or \$9,306 per mile. The operating expenses of the railways embraced in the current preliminary report amounted to \$1,383,584,404, or \$6,451 per mile of line. The preliminary report shows net earnings, \$689,592,921; and for the year ending June 30, 1904, \$634,674,561. The present report shows \$114,636,642 received in the form of income from investments in the stocks and bonds of railway and other corporations and from other miscellaneous sources, making total income, \$804,229,563. The aggregate deductions chargeable against this income were \$713,994,800. The principal items included in such deductions were interest on funded debt, rents of leased lines, permanent improvements charged to income, taxes (which were \$58,533,381) and dividends. Thus the surplus resulting from the operations of these roads was \$90,234,763. The complete report for the year ending June 30, 1904, covering both operating and leased roads, showed a surplus of \$56,729,331, and the like report for 1903 a surplus of \$99,227,469.

The present report shows dividends to the amount of \$196,080,237; dividends declared by practically the same roads in 1904 were \$184,313,472; increase \$11,766,765. The preliminary reports are confined to operating roads, and so exclude dividends declared by subsidiary companies.

The Commission has included in its report some extracts from the recently issued report on the "Commercial valuation of railway operating property in the United States," prepared by the Bureau of the Census. (*Railroad Gazette*, August 18, p. 168.)

SAFETY APPLIANCES AND ACCIDENTS.

Within the past year decided improvement has taken place in the condition of safety appliances on all roads subject to the pro-

visions of the statute, and at no time since the safety appliance law became effective have the results of its operation been so satisfactory as at present. The courts have clearly defined the statute, leaving no room for doubt concerning its application, and the practice with regard to safety appliances is now substantially uniform throughout the country. Another important factor in the betterment of conditions is the abrogation of local agreements at many prominent interchange points, whereby carriers, with the idea of facilitating the movement of traffic, received and delivered cars in defective condition. This action resulted from conferences held with railroad officials at the instance of the Commission. The rule now coming into general observance is that cars will neither be received from nor delivered to connecting roads when safety appliances do not in all respects meet the requirements of the law.

There is a noticeable tendency toward uniformity in couplers and uncoupling attachments and an increase in their strength, decreasing the number of defects. Grab irons are receiving much better attention than formerly. Sill steps, ladders and roof hand holds, when defective, introduce a great element of danger, and these appliances should be covered by the statute.

The great progress in the use of air brakes has been accompanied by marked deterioration in the condition of hand brakes, which may be needed in times of emergency. There is still room for improvement in the maintenance of retaining valves.

On October 1, 1905, out of a total of 1,790,113 freight cars 1,564,396 were equipped with air brakes. About 111,122 private cars are also practically all equipped with this appliance. The Commission has ordered that on and after August 1, 1906, a minimum of 75 per cent. of the cars in all trains required to be operated by power brakes must have their brakes used and operated. This is in lieu of the present lawful minimum of 50 per cent. It is expected this increase will hasten the abandonment of old and light cars which are a menace to safety.

With few exceptions carriers have cheerfully co-operated with the Commission in its efforts to secure compliance with the law, such violations as the Commission has been compelled to report for prosecution being due to laxity of subordinate officials or employees in the performance of their duties, or to their failure to observe instructions, rather than to willful intent of responsible officials to evade or resist the law.

The Commission employs 18 inspectors. With this small number delay in the investigation of complaints is inevitable, subjecting the Government to the charge of laxity to the administration of the law. Some roads complain that successive charges of violation are brought against them, while other roads, which are perhaps greater offenders, escape without prosecution. This is due entirely to insufficiency of the inspection service. The list of roads against which prosecutions have been entered represents merely the area of activity of the inspection service. As a matter of fact, conditions may be vastly better on many roads that have been prosecuted than on roads which have entirely escaped prosecution. Many lives have been saved and many injuries averted through the administration of this law, and a necessary element of proper administration is the maintenance of an adequate inspection service.

Concerning hours of labor on railroads, the Commission refers to the need of a high standard of physical and mental condition for certain classes of employees and care on the part of supervisory officers to see that proper regulations are maintained; but it appears that rules on this subject have been very poorly enforced.

The accidents shown in the monthly reports made by railroads under the law of March 3, 1901, have been regularly published in the Commission's quarterly bulletins. The block system, the lack of which is the cause of those accidents in the most numerous class (rear and butting collisions) is again recommended. The Commission further recommends that the Government should investigate train accidents and promptly furnish the facts concerning them.

The Cost of Locomotive Operation.

XVIII.

BY GEORGE R. HENDERSON.

(Continued from page 520.)

FIRING UP AND CALLING.

Firing-up is done in a variety of ways. The old method was to use wood—scrap or cord-wood, as was available, and even to this day we see piles of fire-wood about the roundhouses. A common allowance was one-eighth of a cord to a fire, and if wood costs \$2.50 a cord, which is a common price in some localities, the material used would represent about 30 cents.

Fuel oil is quite a favorite method nowadays, and reports are made which indicate a very low cost (about 3 cents per fire), but as a matter of fact, the oil is used to ignite the coal, and we may not obtain the same heating effects as with the wood, and it is only proper to charge an amount of coal that, with the oil, would equal the heat of the wood. It is often an advantage, moreover,

to obtain wood ashes on the grate, as with some coals, the oil blast has a tendency to fuse them and form a clinker on the grate bars. The amount of coal used in addition to the wood or oil has been given as low as 500 lbs. and as high as 1,500 lbs., as much depends upon the size of engine, etc.

The cost of the fuel has already been discussed, therefore the labor will be considered here only. The question of firing up engines in a roundhouse is of much importance and must be done by a careful man—boilers have been ruined by incompetent hands building a fire in a boiler that contained no water. After the fire has been lighted, the engine must be watched until taken from the house, and the attendant must see that the water level is maintained, and that the boiler is not allowed to blow-off. One fire builder can attend to a roundhouse turning perhaps 40 engines in 24 hours, that would be 20 fires to start during his watch, or about half an hour's attention per locomotive, and as such men are paid low wages, the labor would probably amount to 10 cents for each fire started. The exact amount will depend on the detail arrangements but the amount is such a small proportion of our operating expenses that it will hardly pay to discuss it further.

Calling is generally performed by boys or young men. The former earn about \$15 a month—sometimes \$20, and they are usually expected to possess a bicycle. If a call takes 15 minutes, as two men must be summoned for each engine, there would be a total time needed of one-half hour per engine, so that the cost of such work should not run over 3 or 4 cents to each locomotive despatched. Between calls the boys do office work, so that the actual expense is trifling.

Handling.

It is usual to group the various items considered in the last articles under the general term of "Handling Locomotives," by which is meant the various duties performed during their stay at a terminal, exclusive of repairs. Sometimes the labor of the coal chute attendance are included, and also boiler washers, but these are actually chargeable to the fuel and water accounts; but although the former is frequently so charged, the latter seldom is treated in this manner.

If we summarize the different items in accordance with our review we find as follows:

Hostlering	50 cents per engine.
Turning	5 " " "
Cleaning fires	15 " " "
Wiping	50 " " "
Inspecting	15 " " "
Firing up	10 " " "
Calling	5 " " "
Total	\$1.50

Inspection of a number of performance sheets of several prominent roads, both eastern and western, shows an average of about 1.3 cents per mile for the different roads. The average mileage per month is perhaps 3,600, which would mean 120 miles a day, and assuming that each engine would reach a terminal once a day we have $120 \times 1.3 = \$1.56$ as the costs, which compares closely with an estimate of \$1.50 above given.

The statement of costs found in the *Railroad Gazette* of Feb. 19, 1904, indicates a wide variation—from 13 cents to \$1.80. It is evident that the first figure is worthless. The average for the items enumerated above and for 11 roads reported in the article mentioned, is \$1.36 per engine. If washing out is frequent and is also charged to this account, as well as the labor on coal trestles, then the total will probably be nearer \$2 an engine than \$1.50. Under any circumstances, the variation, considered as a percentage of the total cost of operation, will be insignificant, but even this discrepancy can be reduced if we know the conditions existing at the terminal points and make corrections accordingly.

It will be noticed at once that these several items, comprised in the general term "handling" are all practically independent of either the distance traveled, the speed attained, or the load hauled, unless the run is so short that cleaning fires and wiping are eliminated, as in the case of brief turn-around trips. Otherwise the cost of terminal expenses is a definite one, and would be as heavy for an engine which had made a 100 mile trip as for another which may have run twice this distance. This leads us at once to the proposition that we cannot decrease these charges by any variation in speed or train load, but by making a greater mileage or a longer trip between terminals, these items may be reduced on a mileage or a ton-mileage basis.

For some years it was customary to divide a road up into engine divisions of about 100 miles each; nowadays the tendency is to increase this to 150 or 200 miles. There is a limit to the length in that the freight trains may not be able to cover it in sufficient time so as not to exhaust the crews. The writer has known of 200 mile divisions that have required over 40 hours for their traverse, which is very excessive. If 12 miles an hour be maintained between terminals (including lay-outs) it will require 12 to 13 hours to make a trip of 150 miles under ordinary conditions, and if unusual delays occur, this will easily extend to 16 or 18 hours, which is quite long enough—too long in fact—for men to stay continuously on duty. With a double-track road, and not too

much passenger traffic to clear, 200 miles can be handled to good advantage, but with single track it is likely that 150 miles is about the maximum length that it would be wise to use for engine divisions in freight service. Passenger runs can be considerably longer, and are often arranged to cover two freight divisions.

Applications.

The application of the foregoing to actual practice is, of course, the important result for which this study has been undertaken, and in order to make this clear a number of hypothetical cases will be worked out, so as to fully illustrate the method of procedure under different circumstances.

Let us see how the investigation will generally be brought to a start. A division of a road exists with a certain combination of grades and levels, curves and tangents. To handle the traffic over this division, a number of locomotives have been provided of definite type or types. There is probably (at least at times) all the freight that can be comfortably hauled by the number of locomotives assigned to that division. The problem, then, that confronts the transportation official is two-fold: To haul the freight at a minimum cost and to obtain the maximum amount of work every month (or week) out of each locomotive in working order. It may be that in working for one result, say low cost, the maximum ton-miles may not be gotten out of the engine; then it will depend upon the amount of business offered, whether it is most desirable to haul more freight at a higher cost, or less at a reduced cost. In times of traffic congestion there is no hesitation in accepting the first alternative. But, as will be shown, it may sometimes happen that not only a low cost per ton-mile, but a high monthly movement per engine can be obtained by judiciously fixing train loads and speeds, and when this is possible of accomplishment, we have obtained the schedule of maximum efficiency, both as to cost and quantity of traffic moved.

As may be expected, the computations necessary for analyzing this subject are lengthy and complicated, but there is so much to be gained by a proper knowledge and observance of the laws involved, that it is well worth the amount of study required. It is evident that there may be any number of operating divisions differing one from the other, and a variety of engines may be placed upon them, so that it would be impossible to present more than a few typical cases. We shall therefore assume certain profiles and consider that they are operated by locomotives of a uniform standard, and it will be clear from what has gone before that any combination may be worked out in a similar manner.

(To be continued.)

Mail Handling Facilities of the Chicago Freight Tunnels.

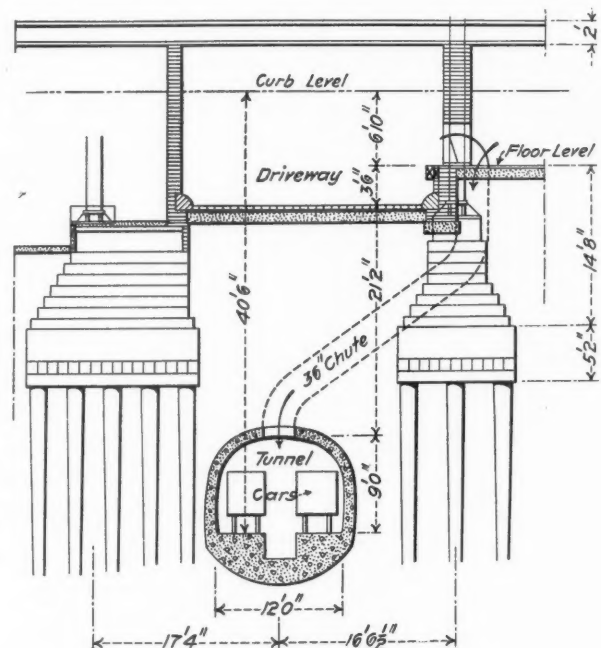
The Illinois Tunnel Company, owning the Chicago freight tunnels, has a contract with the United States Government for the transportation of all classes of mails between the general post office and the railroad stations, and also between the stations. A map of this tunnel system was published in the *Railroad Gazette* July 28, 1905, and showed it to reach all of the principal passenger terminals of the city. The arrangement for carrying the mails requires special connections and facilities at all of these terminals and at the post office, which occupies the square bounded by Jackson boulevard, Dearborn, Adams and Clark streets. In order to obtain a suitable arrangement at the latter place the tunnel company applied to the Government for permission to construct a tunnel under the building at the grade of the existing tunnels, through from Adams street to Jackson boulevard, beneath the driveway under the building, where there were no piles. A commission of engineers was appointed to determine whether such a tunnel could be made without endangering the building foundations in any way. This commission consisted of Gunwald Aus, former Chief Engineer U. S. Supervising Architect's office, Kort Berle, his successor, and General William Sooy Smith, C. E., Chicago. Messrs. Aus and Berle were, of course, familiar with the plans of the building, and General Smith had superintended the construction of its foundations. After careful examination and study of the plans and conditions the commission reported favorably, expressly stipulating, however, that extreme care be exercised in the execution of the work. Permission was therefore granted to build the tunnel under the supervision of an engineer appointed by the Government, General Smith being selected to serve in this capacity.

A transverse section through the tunnel at the center of the building is shown herewith. The purpose of the tunnel is to enable the tunnel cars to be run under the building and unload their contents into a conveyor which discharges in the distributing room; also to receive outgoing mail through suitable chutes, as shown by the drawing. The driveway above the tunnel is the one used by the mail wagons in receiving and delivering their loads.

The building is supported on 5,020 piles, driven without sharpening, to bed-rock or hard-pan. The material through which the tunnel passes is clay of sufficient stiffness and strength to permit its excavation in short sections to a distance of 6 to 10 ft. in ad-

vance of the concrete lining that was put in each of these sections as soon as the excavation was made. A centering of tongued-and-grooved 2 in. plank supported by heavy steel ribs 2 ft. 6 in. c. to c., was put in and the concrete lining resting upon this centering was well tamped, filling the space between the centering and the surrounding surface of the clay. This concrete was 2 ft. thick at the crown of the arch and increased to 2 ft. 6 in. at the springing line. It consisted of 1 part Atlas Portland cement, 2 parts clean sand and 3 parts crushed granite of 2 in. maximum dimension, thoroughly mixed by machinery. It set very hard within four days so that the centering could be safely removed after the expiration of that time; although for the most part it was not taken out in less than a week from the time it was put in place. The work was prosecuted from each end toward the center simultaneously and whenever it became necessary to stop work on either end temporarily the face of the heading was planked and strongly braced to prevent any possibility of slipping.

So carefully was the work done that not the slightest amount of slippage in the surrounding materials occurred. Any such movement was guarded against with the utmost care, as had it been allowed to occur even slightly it undoubtedly would have increased with suddenness, exerting a considerable lateral pressure on the adjacent piles. Any bending under this pressure might have resulted in breakage of the pile under the load carried, permitting settlements and consequent damage to the building. General Smith

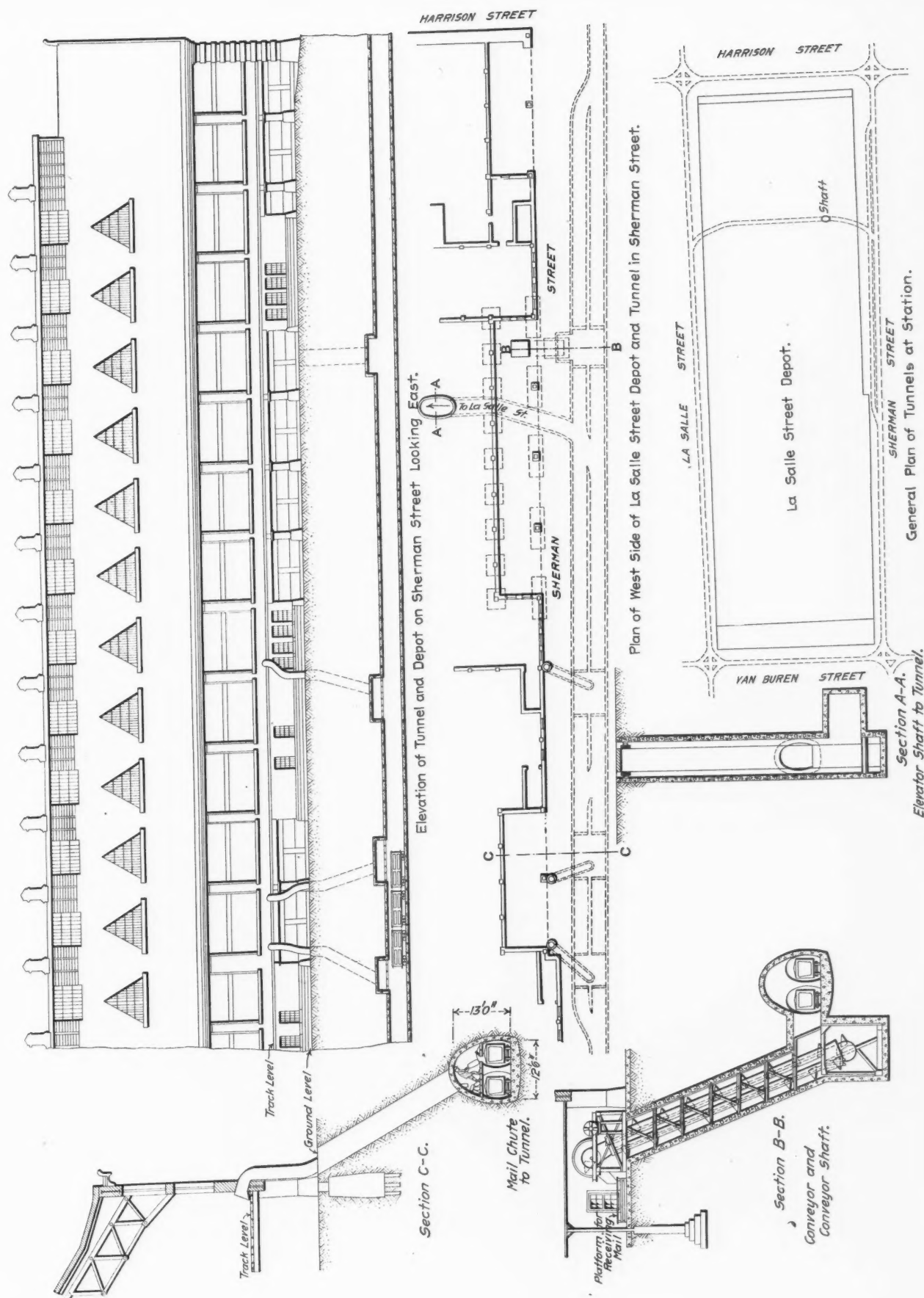


Transverse Section at Center of Building.

was assisted in the work by D. A. Graham, and by F. E. Lockwood, in the employ of the Government.

At the present time connections are being made at two stations: La Salle street, which is the Lake Shore-Rock Island terminal, and Union station, on Canal and Adams streets. The La Salle plan is illustrated herewith as typical. From the general plan it will be seen that the existing tunnels surround the station on all four sides. For convenience of handling the cars and to facilitate the handling of baggage, also included in this plan, a cross-connection is being driven under the train-shed from Sherman street to La Salle street. Under Sherman street, for practically the length of the train-shed, a second bore is being driven, giving a double track arrangement with crossovers between the two tracks.

Outgoing mail will be delivered by the tunnel cars to a conveyor, which automatically delivers it onto a receiving platform in the mail room under the elevated tracks of the terminal. The details of the arrangement are shown at section B B. For incoming mail three chutes are provided at suitable points toward the inner end of the train-shed, as shown by the plans, for delivery to the tunnel cars. The mouths of these chutes are just above the track floor of the train-shed and they pass through the west wall of the latter. Each chute discharges on a platform at the level of the tunnel top, the mail pouches being dropped through traps in the platform into the cars. Headroom above the platform is provided by enlarging the excavation at this point to the width of the twin bore, 12 ft. 6 in., and a height of 13 ft. From the crossover tunnel to La Salle street an elevator shaft will connect with



Chicago Freight Tunnels; Connection With the General Post Office.

the room above. In it will be installed an electric baggage elevator of 20,000 lbs. capacity and a speed of 100 f.p.m.

The amount of mail to be carried daily by the tunnels when the system is in full operation is estimated at 700 tons. It is hoped that the service can be inaugurated by the first of January or shortly thereafter. The cars to be used in this service were described in the *Railroad Gazette* June 24, 1904. They were designed by Mr. W. P. Bettendorf, of the Bettendorf Axle Company, Davenport, Iowa.

The work at the stations is in charge of Mr. George W. Jackson, Chief Engineer of the Illinois Telephone Construction Company, who kindly furnished the plans of the La Salle street station arrangement. We are indebted to Gen. Wm. Sooy Smith for the drawing and information relative to the work at the general post office.

Electrification on the Pennsylvania Railroad.

The following is the official statement by the General Electric Company: Hitherto the electrification of steam roads has been confined practically to terminal facilities and local service over short distances, so that the recent decision of the Pennsylvania Railroad to equip electrically a portion of its system between Camden and Atlantic City, New Jersey, is of the greatest interest. The developments which have taken place at New York under the direction of the New York Central and New York, New Haven & Hartford railroads have focused the eyes of the engineering world on this branch of railroad engineering. This further advance of electric traction, coming as it does when this special phase of railroading is fresh in the minds of the engineers, marks another milestone passed in the march of progress of electric traction.

That portion of the Pennsylvania Railroad about to be electrified, comprises sixty-four miles of steam road lying between Camden and Atlantic City, New Jersey. The route includes the station of Newfield, between which city and Camden there is already a double track roadway. The double tracking will be continued to Atlantic City, following the line of the single track already existing between that city and Newfield. Over this double track line an express electric service will be established, cars having a headway of fifteen minutes and making the run from Camden to Atlantic City in eighty minutes without stops. The maximum speed of the cars will be between 55 and 60 miles per hour.

In addition to the through service to Atlantic City there will be a half-hourly local service, consisting of trains of two cars between Camden and Millville, 40 miles, and ten-minute service of single cars between Camden and Woodbury, 8½ miles. Full service will call for 58 hours in operation, each equipped with two 220-h.p. direct current motors, known as GE-69. The motors will be similar to those now being manufactured by the General Electric Co. for the equipments of the New York terminal of the New York Central & Hudson River Railroad. These motors will be controlled by the Sprague-General Electric automatic multiple-unit system, which will permit the operation of cars in trains, all of the motors being under the control of the motorman in the cab of the forward car.

The third-rail system will be used throughout, except on the section between Camden and Woodbury, and Newfield and Millville, where the cars will be run on overhead trolley, the speed on these sections being less than on the main line.

Power for the operation of the cars will be supplied from a power house located at Camden, containing three 2,000-k.w. General Electric-Curtis turbines of the three-phase alternating-current 25-cycle type. Transmission at a potential of 33,000 volts will be made to six substations between Camden and Atlantic City, and the seventh substation at Millville to supply that section of the line between Millville and Newfield. A total capacity of 11,000 kw. in rotary converters is provided in the substations delivering direct current to the third-rail at a potential of 650 volts. Individual units will have a capacity of 750 k.w., and will be of the standard General Electric type. They will be started from the alternating current end by means of taps on the step-down transformers in accordance with standard General Electric practice.

A New Railroad in Ecuador.

The Government of Ecuador will build a railroad from Ambato, in the province of Tungurahua, to San Antonio, at the head of navigation on the Curaray river, 120 miles. The object is to develop the rich district east of the Andes mountains, which abounds in cedar, rosewood, rubber and the many hard and dye woods characteristic of the upper Amazon country, and which is at present inaccessible through lack of transportation facilities. The new line will also shorten the distance for transporting the upper Amazon rubber, by connecting with the Guayaquil & Quito Railway at Ambato, thence to the port of Guayaquil on the Pacific side, making a haul by rail of 277 miles, and the entire distance to New York 4,000 miles, instead of 7,000 miles, as at present by way of the Amazon river.

Besides the many valuable woods, the soil is exceedingly rich and the climate healthy.

Starting at an elevation of 8,500 ft. at Ambato the road will follow the valleys of the Rio Ambato and Rio Pastaza to a point near the town of Barrancas, a short distance from the gold country, thence across the Barrancas plains to San Antonio on the Rio Curaray, at an elevation of 2,700 ft. The maximum grade will be 2 per cent. compensated, for a maximum curvature of 7 deg. The gage will be 42 in.

Eventually electricity will be the motive power. The cascade of the Rio Pastaza has a sheer drop of 198 ft., capable of developing 260,000 h.p. in the dry season, which lasts from March until December. Three other falls conveniently located on tributaries are capable of 10,000 h.p. each, assuring abundance of power.

The estimated cost of construction and equipment is \$6,000,000 gold, which the Government will appropriate from special funds for this purpose, \$1,000,000 of which will be spent during the coming year. In a few weeks a plant necessary to put 2,000 men at work will be purchased in this country, and it is expected that actual work will commence in three months.

The Government has appointed a commission of seven, including members of the different political parties, to supervise this work, headed by Luis A. Martinez, Director General of Public Works, of Quito. The reconnaissance was made by Chas. H. Moore, First Assistant Engineer of the Erie Railroad, who recently returned from Ecuador, and details of the survey have been worked out by his assistants, W. G. Fox, formerly division engineer on the location of White River branch of the Missouri Pacific, and W. A. Welch, formerly resident engineer, Pittsburg, Shawmut & Northern.

Shop Fads and Fancies.

In a paper read before the Western Railway Club at the October meeting Mr. W. E. Symons called attention to the expensiveness of certain shop fads and fancies, and showed how much trouble had been created by seemingly insignificant mistakes. He told of one lot of locomotives that had been carefully designed and inspected, but upon being placed in service were found to be very unsatisfactory because of high fuel consumption. The application of the indicator showed an exceedingly defective steam distribution, due to excessive clearance; when it was found that the pistons were 5 in. thick instead of 6 in. For temporary relief the eccentrics were given more angular advance, thus providing about ¼ to ⅞ in. lead until pistons of the required thickness could be secured. Following this the eccentrics were moved back to normal positions, providing about ⅞ lead. It is worthy of mention in a comparison of the engine performances before and after the change had been made, where conditions of speed, etc., were about the same, that there was a gain of 96.73 horse-power in one case and 42.9 in the other, and this with about 25 per cent. less fuel, engine running cool and using about one-quarter less water.

It requires only a slight arithmetical calculation to find how many thousand dollars half a dozen engines in this condition would waste in one year, even on a road of some considerable size where no such structural defects exist, even where the question of value, adjustment and steam distribution has been passed by, on account of "our standards," or the idea that as long as "she sounds square it's all right." It is a fair guess to say that 20 per cent. on hundreds of thousands of dollars could be saved by going into the matter in both a "theoretic" and "practical" manner, that would not conflict with sound engineering principles.

Another case was cited where badly steaming engines, whose delays were invariably attributed to poor coal, were found to have but from 18 to 23 per cent. opening in the grates. A certain engine limped badly at high speeds, but was all right when running slow. The application of an indicator showed a contracted passage in the steam pipe on one side, caused by a piece of the core falling out and shutting off more than one-half of the pipe. A new pipe was applied and all the trouble removed.

As a rule, the efforts made to remedy engine failures are largely in proportion to the number of failures, instead of being directed toward any particular character of failure, and very little distinction is made in the different ones; when if one would only pause to analyze them, it is plain that some result from improper manipulation of the engine, some from defective design, some from structural defects or faulty workmanship, and some from a combination of two or more of the above causes. It is to what may be called combination defects that attention should be drawn.

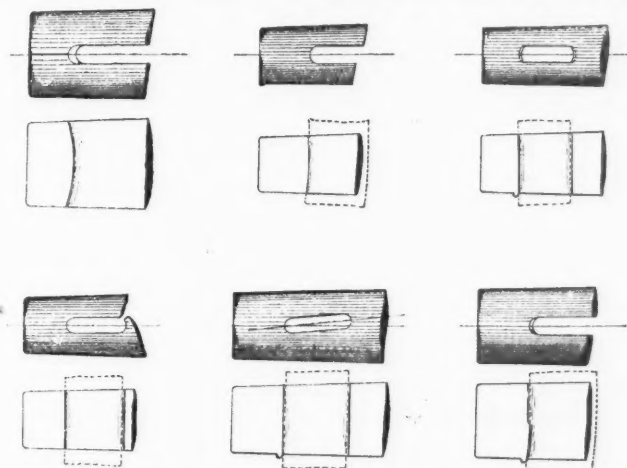
There is probably no part of an engine where so much depends on good, honest efficient work on the part of the machinist employed as in fitting up and assembling for service the cross-head end of a piston rod.

The designs, or various so-called standards, are, in my opinion, open to criticism, in that they represent in many instances the ideas, fads, fancies or hobbies of some individual rather than being based on sound engineering principles. Aside from this lament-

able feature, however, the question of defective or poor workmanship is of vital importance, and has not received the attention it deserves. A large percentage of piston rods which fail on the road are improperly fitted to the cross-head or the keyway, and in some instances actually mutilated, and this is sometimes almost unknown to the machinist who may drive the key home in assembling these parts, although he should inspect with a view of detecting any faulty workmanship even though someone else may have been responsible for it. One of the prime reasons why it is possible for an engine to leave the shops in this condition is, that it is one of the parts of an engine which can be put together in a manner so defective as to be actually dangerous, and still leave no trace or clew by which to detect it.

Some years ago, while in charge of the motive power department on a line with six sub-divisions, I noticed we were having a great many engine failures due to broken piston rods. The most searching inquiries were made, and positive orders were sent out to thoroughly investigate and apply the necessary remedy, to which the Master Mechanics invariably answered that they were complying; yet no results were forthcoming. The number seemingly increased and on one or two divisions it almost took on the form of an epidemic. The stereotyped excuse was almost invariably "poor material."

I ordered the end broken off in each case, sent to my office along with the report of the accident, with the result that almost without exception the failures were due to such miserably inefficient shop methods as to admit of neither defense nor apology. A few samples of these badly mutilated and broken rods were taken at random, their true dimensions and condition reduced to a draw-



Specimens of Mutilated Piston Rods.

ing, blue prints made therefrom and displayed in each shop under the caption or heading of an object lesson. A meeting of Master Mechanics and foremen was held and the question of broken piston rods passed into history.

The accompanying illustration is a reproduction of the mechanical monstrosities referred to.

As for power plants, modern establishments economically administered are few and far between, and the great majority could not stand an investigation. Some years ago, the saw and planing mill of a small railroad company was found to be producing less than half of its original and rated capacity. In short, matters were in such bad shape that something had to be done. Indicator cards taken from the engine showed such defective steam distribution that the valve gear was overhauled, the mill being shut down for the purpose. At the end of five days the mill was in shape to cut from 48,000 to 50,000 feet per day.

Summary of case:—
Reduced output of mill (30,000 ft. per day at \$10 per 1,000), 6 mos. \$46,800
Four extra firemen, 6 months, \$2.00 per day. 1,248
Four cords of wood per day, 6 months, \$2.00 per cord. 1,248

Total\$50,246
which was remedied for the trivial sum of about \$150.

The Pekin-Hankow Railroad.

Trains are now running over this road between Hankow and Pekin, 754 miles, though the operating department does not encourage through passenger traffic and does not intend to do so until the completion of the bridge over the Yellow River. At present the journey takes four days, no traveling being done at night. After the completion of the bridge it is proposed to run trains through in thirty-six hours, and they will have sleeping and dining cars. At present, the foreigner who wishes to ride in comfort must engage a special car and must furnish his own blankets and pillows

so as to sleep in the car at night. He also has to take along a servant so as to provide his own meals. The native population throughout the line has the appearance of being strong and healthy as well as contented. Few beggars are seen. There is not an advertisement in sight, except one of American cigarettes at Pao-Ting-Fu. The railroad telegraph line is equipped for the use of telephones, and telephones are carried on trains for use in emergency, the "fish-pole" arrangement being used to connect with the line.—*Report from Consul-General Sammons.*

A press despatch announces that this road was opened for traffic on November 14. Special trains from the two termini carried guests to the point where the new road crosses the Yellow river. Among these guests were representatives from the consulates and legations of France, Belgium, Germany and Russia.

Train Accidents in the United States in November.¹

unf, 1st, St. Louis & San Francisco, Compton, I. T., a south-bound passenger train was derailed by a cow and the engine was overturned. The engineman was killed and the fireman seriously injured.

unx, 2d, Atchison, Topeka & Santa Fe, Stillwater, O. T., a mixed train with a dead engine at the rear was derailed the tender of the dead engine jumping the track near a bridge, and this engine and one car broke down two spans of the bridge and fell to the stream below. One employee riding in the dead engine was injured.

*rc, 3d, Michigan Central, Hartsdale, Ind., a gravel train with an engine at the rear, standing on the main track, preparatory to moving into a connecting track leading to the Indiana Harbor Railroad, was run into at the rear by a westbound freight train, damaging both engines and wrecking one car in the freight train and the caboose of the gravel train. A brakeman of the gravel train was killed and another trainman and a man riding with a car of horses on the freight train was injured. The wreck took fire and was partly burned up.

*xc, 3d, 2 a. m., Fort Worth & Denver City, Clarendon, Tex., a freight train ascending a grade was divided in consequence of the inability of the engine to haul the whole of it, and the cars left behind were accidentally started, in some way not explained, and ran back on the main track some distance and into the head of a following freight, wrecking the engine and 11 cars. The wreck took fire and was mostly burned up. One brakeman was killed and two other trainmen were injured.

ixc, 3d, Southern Pacific, Santa Margarita, Cal., collision of passenger trains; 19 passengers injured, two of them fatally.

o, 3d, Houston & Texas Central, Ennis, Tex., the locomotive of a freight engine was wrecked by the explosion of its boiler; the engineman and one brakeman were killed and the fireman was injured.

xc, 4th, Central of Georgia, Gordon, Ga., collision of freight trains; conductor killed, four other trainmen injured, one of them fatally.

unx, 5th, Southern Pacific, Galveston, Tex., a passenger train was derailed on a sharp curve and the engineman and fireman were severely scalded, the fireman fatally.

be, 6th, Baltimore & Ohio, Washington, Pa., butting collision of freight trains in a tunnel; one engineman killed and two other trainmen injured.

*bc, 7th, 5 a. m., New York Central & Hudson River, Liverpool, N. Y., butting collision between a southbound freight and a northbound passenger train, wrecking both engines and several cars, all of which fell down a bank. A freight car loaded with matches took fire and the combustible part of the wreck was burned up. Four trainmen were killed. The freight train had disregarded a meeting order.

xc, 7th, 1 a. m., Buffalo, N. Y., collision between a freight train of the Delaware, Lackawanna & Western and a freight of the Buffalo Creek Railroad; one engineman killed.

dr, 7th, Pennsylvania road, Hastings, Pa., a passenger train was derailed by a broken rail and the engineman and fireman were injured.

bc, 8th, Delaware, Lackawanna & Western, Hunlocks Creek, Pa., butting collision between a passenger train and a freight train, both running at full speed. Six trainmen were killed and several

¹Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc Rear collisions.
bc Butting collisions.
xc Miscellaneous collisions.
dr Derailments; defects of roadway.
eq Derailments; defects of equipment.
dn Derailments; negligence in operating.
unf Derailments; unforeseen obstruction.
unx Derailments; unexplained.
o Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more persons.

other persons were injured. The freight train had run past an appointed meeting station. The engineman of this train, who was killed, was held responsible by a coroner's jury. The jury also charged the conductor with negligence in not examining air-brake angle cocks before beginning his trip.

rc, 9th, Northern Pacific, Missoula, Mont., a freight train standing in the yard was run into at the rear by a passenger train, and 20 persons were injured. There was a dense fog at the time.

xc, 9th, Pennsylvania road, Granville, Pa., collision at converging tracks between a passenger train and a mail train, both moving in the same direction. One engine and two mail cars were wrecked and one fireman was killed.

unf, 9th, Alabama & Vicksburg, Bovina, Miss., a passenger train was derailed by running over a bovine, and the engine and tender fell down a bank. The engineman was severely burned.

rc, 10th, Norfolk & Western, Iager, W. Va., rear collision of freight trains; three trainmen killed, two injured.

unx, 11th, 3 a. m., Southern Railway, Burnsville, Miss., passenger train No. 42 was derailed and one passenger car was overturned. One passenger was injured.

unx, 11th, Texas & Pacific, Aledo, Tex., eastbound passenger train No. 6, consisting of two engines and 15 cars, was derailed, and three passenger cars were badly damaged. One fireman was killed and eight other persons were injured.

bc, 13th, Philadelphia, Baltimore & Washington, Nottingham, Pa., butting collision of passenger trains, wrecking both engines. One engineman was killed and two other trainmen and several passengers were injured.

xc, 13th, Chicago, Rock Island & Pacific, Dover, O. T. a freight train broke in two and the rear portion afterward ran into the forward one, injuring several passengers and two trainmen.

*eq, 13th, Delaware & Hudson, Dyes, N. Y., passenger train No. 5, running at high speed, was derailed, making a bad wreck. The mail car took fire and was burned up. The fireman was killed and a mail clerk and several passengers were injured. A broken journal, or some other defect in one of the trucks, is believed to have been the cause.

dn, 13th, Bessemer & Lake Erie, Shenango, Pa., a freight train approaching the crossing of the Erie road became uncontrollable and was derailed at the derailing switch, 10 cars being ditched.

unx, 13th, Southern Railway, Greenville, Miss., a work train was derailed and the engine was overturned. Seven employees were injured.

xc, 16th, Southern Railway, Salisbury, N. C., an empty engine, running backward, collided with a train carrying a large number of employees to Salisbury from the shops at Spencer, and eight employees were injured. In the employees' train the engine was at the rear.

unx, 17th, St. Louis & San Francisco, Deckerville, Ark., a passenger train was derailed, from some cause unknown, and several passenger cars were overturned and fell down a bank; but although all of the passengers were badly shaken, no one was seriously injured.

rc, 18th, Baltimore & Ohio, Rawlings, Md., a freight train which was taking water was run into at the rear by a following freight, and the engine, caboose and several cars were overturned and fell down a bank. One brakeman was killed and two other trainmen were injured, one of them fatally.

rc, 19th, Minneapolis, St. Paul & Ste. Marie, Detroit, Minn., a freight train, standing at a station, was run into at the rear by a following freight, wrecking the engine and caboose. In the caboose were the conductor, his wife and one daughter. Two of these were killed and the third was injured.

bc, 19th, Baltimore & Ohio, Warren, Ohio, butting collision of freight trains, wrecking both engines and several cars. One fireman and one brakeman were killed and one engineman was injured.

unx, 19th, Lehigh Valley, Tonawanda, N. Y., a car in a freight train of the Lehigh Valley was derailed and fell across the adjacent main track of the New York Central & Hudson River, and was run into by a freight of the N. Y. C. moving in the opposite direction. The engine of this train was overturned and the engineman was killed.

dn, 20th, Erie road, Falconer, N. Y., eastbound passenger train No. 8 was derailed at a derailing switch, and the enginemen of both of the two engines drawing the train were killed. The train was running at good speed and the enginemen evidently disregarded the stop signal at the block station.

rc, 23d, Southern Railway, Columbiana, Ala., a freight train which had been stopped because of some defect in the engine was run into at the rear by a following freight, and the engineman of the standing train, who was under the engine, was killed.

bc, 23d, Baltimore & Ohio, Albion, Ind., butting collision of work trains making a bad wreck and causing the death of three trainmen and two laborers. Several others were injured, two of them fatally. There was a dense fog at the time. Conflicting orders had been given by the despatcher, so that both trains had orders giving them the right of way.

†xc, 24th, Boston & Maine, Wayland, Mass., a passenger train

ran over a misplaced switch and collided with a freight train standing on the side track, badly damaging both engines and three freight cars. One of the cars in the passenger train was wrecked for half its length and one passenger, an infant of two years, was killed. The passenger engineman and the mother of the child were severely injured.

eq, 24th, 6 a. m., Pennsylvania road, Thompsettown, Pa., several cars in a westbound freight train were derailed by the sudden stoppage due to the rupture of an air-brake hose and the consequent automatic application of the air brakes, and fell across the adjoining westbound passenger track. Newspaper train No. 23, on this track, ran into the wreck and its engine and all of its three cars were badly damaged. There was a dense fog at the time. One brakeman of the freight was killed and eight other trainmen were injured.

bc, 25th, 6 p. m., Missouri Pacific, Leeds, Mo., butting collision between a passenger train and a switching freight train which was using the main track without right, damaging both engines and several freight cars. Five trainmen and about 30 passengers were injured, all of them slightly.

†o, 25th, Norfolk & Western, Bluefield, W. Va., passenger train No. 16 was split at a switch and part of the cars entered a side track. The passengers were greatly alarmed and many of them tried to get out of the cars. Two of these were injured, one of them fatally.

†*rc, 26th, 8:13 p. m., Boston & Maine, Baker Bridge, Mass., a westbound accommodation train, just starting from the station, was run into at the rear by a following express train drawn by two engines, and both of the two passenger cars of the way train were wrecked. Seventeen persons, mostly passengers on the local train, were killed, or fatally injured, and about 30 other persons were injured. The accommodation train was considerably behind time and the rear brakeman had thrown off two or three fuses, but these were not heeded by the runner of the leading engine of the express. This runner also disregarded two caution signals displayed by highway crossing watchmen. The runner of the second engine of the express shut off steam on seeing one of the caution signals, but did not apply brakes; neither did he signal to the leading engineman. This accident was reported in the *Railroad Gazette* of December 1, page 520; December 8, page 541, and December 15, page 566.

xc, 26th, Boston & Maine, South Waterboro, Me., collision of freight trains at a meeting station, wrecking both engines and nine cars; both firemen and one brakeman were killed.

o, 26th, Colorado Southern, Boreas Pass, Col., three cars of a passenger train were lifted from the rails by a high wind, but all of them remained upright and were stopped before they had fallen off the roadbed.

bc, 28th, Kansas City Southern, Horatio, Ark., butting collision of freight trains, wrecking both engines and seven cars. One engineman and one fireman were killed.

unf, 28th, Pittsburg, Cincinnati, Chicago & St. Louis, Kenneth, Ind., a freight train was derailed at a culvert which had been partially washed out, and 18 cars were ditched. Two trainmen were injured.

rc, 29th, 6:20 p. m., Boston & Maine, East Everett, Mass., a northbound local passenger train of six cars, about three minutes behind time, was run into at the rear by a following freight train consisting of two engines and 33 cars, which had left the last preceding station about one minute behind the passenger train. About 20 passengers were slightly injured. The freight engineman had disregarded three automatic block signals set against him, and the passenger train was 2,000 feet beyond the third signal. This accident was reported in the *Railroad Gazette*, December 15.

bc, 29th, Chesapeake & Ohio, Charlottesville, Va., an empty engine, deserted by the engineman because of the approach of a runaway freight car, on another track, which threatened to collide with him, had its throttle valve opened in some way and ran some distance on the main track to a point where it met two engines coming in the opposite direction, with which it collided. Four employees were injured and all three engines were badly damaged.

unf, 29th, Zwolle & Eastern, Zwolle, La., a freight train was derailed by a tree which had fallen across the track, and the engine, one box car and five loaded log cars were wrecked. One person was killed and five were injured.

unx, 29th, Atchison, Topeka & Santa Fe, Romero, N. Mex., passenger train No. 1, consisting of two engines and seven cars, was derailed, the second engine and first four cars being overturned and one passenger car badly damaged. One engineman was scalded to death and four trainmen and several other persons were injured.

dn, 30th, Norfolk & Western, Davy, W. Va., a westbound freight train was derailed at a misplaced switch and the engine and several cars were wrecked; engineman and fireman were killed.

unx, 30th, 10 p. m., Central of New Jersey, Penn Haven Junction, Pa., a passenger train running at full speed was derailed and the engine and first two cars fell down a high bank into Lehigh river. The fireman and an employee of the road riding in the first passenger car were killed and 12 persons were injured.



GENERAL NEWS SECTION

NOTES.

The Louisville & Nashville is preparing to plant 250,000 catalpa trees at Bay St. Louis, Miss., and Carneys, Ala.

Senator Millard, of Nebraska, has retired from the Senate Committee on Interstate Commerce, and Senator W. M. Crane, of Massachusetts, has been appointed in his place.

The New York Central is preparing to adopt green for proceed and yellow for caution as the night indications in fixed signals. The Hudson and the Harlem divisions will be changed first.

According to a Chicago press despatch, the messengers of the United States Express Company, running to and from that city, are now required to practice in a school of pistol marksmanship four times a month.

The Toledo, Bowling Green & Southern Traction Company proposes to put in a large number of short side tracks between Toledo and Findlay for the purpose of promoting the grain traffic. The company intends to accommodate all of the farmers along its line.

The Atlantic Coast Line and the Armour Car Lines have assured the Truckers' Association at Wilmington, N. C., that for the next strawberry season 2,000 refrigerator cars will be furnished, and that four-fifths of these will be 40-ft. cars. The railroad also promises improved motive power.

The Wabash has announced that it will carry corn from the Missouri River to the Atlantic Seaboard for export at 19 cents per 100 lbs. This rate is to stand until January 1. It is made to meet the 28½-cent rate through to Liverpool recently made by the Chicago, Milwaukee & St. Paul.

On Monday of this week the Chicago & North-Western and the Chicago Great Western announced a rate on export corn of 8¼ cents from Missouri river points to Chicago. This rate is made to compete with the reductions by other lines recently announced, and expires December 31.

According to a Chicago Press despatch the Rock Island road has given orders to its freight agents to decline packing-house products at Missouri River points, the officers of the company having concluded that on account of the high speed and the other expensive elements of this service, the interest of the road requires that it use its facilities for other classes of freight.

On the night of December 16 the North Coast Limited express train of the Northern Pacific was stopped by robbers 15 miles west of North Yakima, Wash., and the express car was blown open with dynamite. The express and mail cars were first moved forward a half mile away from the rest of the train and the passengers were not molested. It is said that the robbers secured but very little money.

The shipments of potatoes over the Bangor & Aroostook Railroad during the month of November amounted to 716,511 bushels; and total crop of the year to date, 2,358,098 bushels, or an increase of 390,559 bushels over the same period last year. The Aroostook County shippers have large contracts for delivery of seed potatoes in January and February, a large proportion going to Texas and other Southern States.

The action of Governor Toole, of Montana, in vetoing the Railroad Commission Bill, passed by the Legislature of that State at its last session, is not to be allowed to settle the matter. The "Montana Rate Association" has been organized at Helena and is going to ask the Governor to call an extra session. The Association also proposes to go before the Interstate Commerce Commission with complaints of discrimination on interstate business.

Press despatches of December 15 and 16 report indictments for violation of the freight rate laws at Philadelphia, Chicago and Kansas City. At Philadelphia the Eastern Agent of the Mutual Transit Company, the company itself and the local agent, the agent of the Great Northern Railway and several shippers were indicted for giving or accepting rebates on shipments of iron pipe to Winnipeg, and on other articles. The National Essence for Coffee Company secured immunity from prosecution by voluntarily surrender-

ing books and papers. At Chicago, the Chicago & Alton Railway and two of its former officers, John N. Faithorn, Vice-President, and F. A. Wann, General Freight Agent, were indicted for paying illegal rebates to Schwarzschild & Sulzberger; also for giving free transportation to employees of that firm. At Kansas City indictments were returned against George H. Crosby, of the Burlington, L. B. Taggart, his chief clerk, the Chicago, Milwaukee & St. Paul Railway Company, and a number of shippers. The Alton Road and its two officers were indicted here on the same charges as in Chicago. Among the shippers indicted were the Armour, the Swift and the Cudahy Packing Companies and Nelson Morris.

Bids for Philippine Railroads.

The bids were recently opened at the Insular Bureau of the War Department for concessionary grants to be made by the Philippine government for the construction of railroads in the Philippine Islands, as provided by act of Congress. The proposed lines aggregate 1,235 miles. Lines are to be built on the Islands of Luzon, Panay, Negros, Cebu, Leyte and Samar. Speyer & Co., of New York, offered to build about 425 miles on the island of Luzon without government guarantee of bonds. This offer was made in connection with the existing Manila Railway Company, Limited, which now has in operation over 200 miles of railroad in Luzon. Speyer & Co., in connection with their bid, asked for concessions under which to build branches of the existing Manila & Dagupan Railway, and if their bid is accepted it probably will result in the operation under one management of 633 miles of railroad on the island of Luzon. Morris McMicken, G. Gresskens, G. Poncin, Jacob Furth and E. C. Hughes, of Seattle, offered to build 100 miles of railroad in southern Luzon. Kean, Van Cortland & Co., J. G. White & Co., Charles M. Swift, with whom are associated Cornelius Vanderbilt, R. T. Wilson & Co., and the international Banking Corporation, offered to build 100 miles on the island of Panay, 100 miles on the island of Negros, and 95 miles on the island of Cebu under a 4 per cent. guarantee for 30 years on 95 per cent. of the cost of construction. Their bid stated that the construction would be done by J. G. White & Co.

Cuba Eastern Extension.

The Cuba Eastern Railroad, which now operates about 30 miles of road in the province of Santiago de Cuba, is planning an extension from its northern terminus, San Pre, westerly through the La Maya valley to San Luis, about 40 miles. This is a rich sugar district, and the new line will broaden the traffic of the road, now mainly timber. A large sum is to be spent in developing the agricultural possibilities of the new territory. This will include the building of about 30 miles of narrow gage tramway for carrying sugar cane to the mills. Much of the grading on the extension has already been finished, and the company is now in the market for 80-lb. rails and about 2,000 tons of bridge material, as well as for cars and locomotives. The maximum grade on the new line is to be 2 per cent., and it is hoped to have the line in operation within the next few months. The President of the company is H. W. Bennett, of New York. A. V. Sims, Guantanamo, Cuba, is Chief Engineer and General Manager. The New York offices of the company, including those of Mr. De Zayas, the Purchasing Agent, are at 79 Wall street.

Relief for the Train-Accident Record.

The football season is closed and the record of casualties, as tabulated by the *Tribune*, shows a list of 18 killed and 159 injured. The hunting season in Wisconsin and Michigan is closed, and the casualty list shows 26 killed and 55 wounded, some of whom will not recover. The complete record of casualties since July shows 70 killed and 89 wounded. The automobile season is a continuous one. In the principal cities of the United States these machines have killed, since the year began, 66 persons and nine in smaller places, and injured 463 persons in cities and 46 in villages, a total of 75 killed and 509 injured in 11 months. The killing of these 157 persons by the three agents of destruction mentioned is sheer and culpable waste of life. Modern civilization is now so complex and exacting that a considerable loss of human life is inevitable. There must be a certain number of persons drowned, burned, killed by railroad and steamboat disasters, explosions, mine accidents, lightning, cyclones, storms and electricity. There will be several thousand of them this year. Their loss must be accepted as one of the debts we pay to the constantly changing methods of civiliza-

tion, and it will grow larger from year to year as life and transportation and business grow more complex and their problems of operation more difficult and dangerous.—*Chicago Tribune.*

New York Rapid Transit Commission.

At a recent meeting of the Chamber of Commerce of New York, the Chamber presented to each member of the Rapid Transit Commission a gold medal, commemorating the service of these gentlemen to the city in building the Subway. The members of the Commission are: Messrs. Alexander E. Orr, Morris K. Jesup, John Claffin, Woodbury Langdon, Seth Low, John H. Starin, and Charles Stewart Smith.

Cabinet for Train News Agent's Stock.

Mr. Albert Headley, General Foreman of the car department of the Duluth & Iron Range, has put into effect a plan to utilize the space which had been occupied by Baker heaters in the company's smoking cars, these heaters having been displaced. It was prompted by the custom of news agents of using one or two seats in the smoking car for storing and exhibiting their stocks. Mr. Headley builds in the heater space a cabinet 5 ft. high with a railing around the top, which is finished outside to correspond with the car interior. Suitable shelving is placed within the cabinet, which, as the plan shows, is divided between the door and the cabinet proper. The position and dimensions of the cabinet are such as to make use of the space conveniently and to the best advantage. Besides making available for the use of passengers the seats formerly taken up by the news agent, the seat adjoining the cabinet is added. The cabinet enables the news agent to take care of his stock in much better shape than formerly.

Chicago Tunnels.

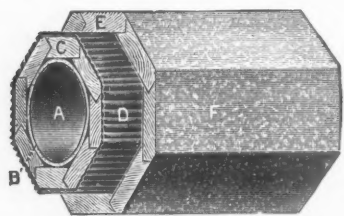
At a recent meeting of the directors of the Illinois Tunnel Company, A. J. Darling, President of the Chicago, Milwaukee & St. Paul, was elected Chairman of the Executive Committee.

Wyckoff's Water-Proof Steam Pipe Covering.

The accompanying illustrations show the general design of the Wyckoff's water-proof steam pipe coverings used for both underground and exposed steam and hot water pipes. This covering is constructed of eight thoroughly seasoned white pine staves, one inch thick. These staves are joined, as shown, and are wound with heavy galvanized steel wire and wrapped with two layers of heavy corrugated paper. Another casing of one inch white pine jointed staves, wound with galvanized steel wire, is placed over the first covering, as shown, thus making two casings of wood, each one inch thick, with a non-conductive lining of corrugated paper between.

The corrugated paper forms an air chamber between each layer of wood and paper, thus adding to the covering's non-conductive qualities. For underground use, the covering is completely coated on the outside with asphaltum pitch. When used overhead it is furnished painted on the outside with black asphaltum paint. The covering is made in lengths of from 4 to 8 ft. The lengths are connected by tenon and socket joints. In putting it over the pipes it requires simply to be driven together.

Where the pipes are in place and cannot be disconnected for



A—Tin Lining. B—Asbestos. C—Wood. D—Corrugated Paper. E—Wood. F—Asphaltum Coating.

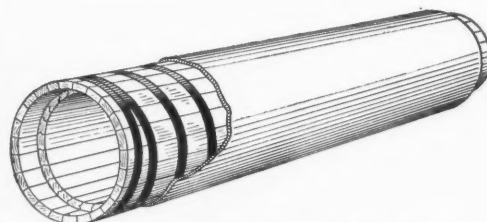
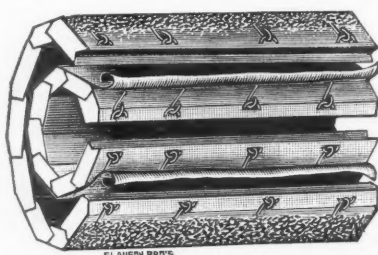


Fig. 1—Wyckoff's Steam Pipe Covering. Fig. 2—Wyckoff's Steam Pipe Covering. Fig. 3—Wyckoff's Steam Pipe Covering.

the purpose of sliding the covering on, a patent covering opened, as shown in Fig. 2, is furnished; to prevent the wood from charring when the covering is used on high pressure steam pipes, the covering is lined with tin and two layers of asbestos paper, as shown in Fig. 1.

The Wyckoff Co. also make water-proof wood stave covering as a substitute for the solid log. This pipe is made of seasoned white pine staves, two inches thick, carefully selected, free from sap and other imperfections, jointed together, wound with steel hoop and coated with asphaltum.

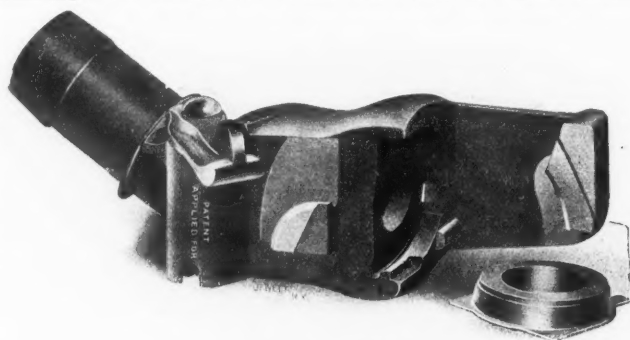
This covering is also made in lengths of from 4 ft. to 8 ft., each connected by a socket joint. It can be put together easily and properly by any ordinary laborer.

Fig. 3 shows the wood stave covering wound with steel hoop and coated with asphaltum cement, with a portion of the cement removed to show the steel hoop with which the pipe is wound.

These pipe coverings are made by A. W. Wyckoff & Son Co., Elmira, N. Y.

The Consolidated Steam Coupler.

The accompanying illustration shows the Consolidated Car Heating Company's new type of steam hose coupler. With the exception of the automatic lock, the coupler has but two parts, the coupler head and the gasket. The gasket slides into place in a machined groove and is firmly locked in place by slightly bending the light steel lug formed on it. No springs are required to hold the gasket in place and there is no obstruction in the steam passage. It has a full 1½-in. opening and is interchangeable with smaller sizes of couplers. When used with couplers having an opening less than 1½ in. in diameter it is fitted with a slightly smaller gasket.



A New Steam Hose Coupler.

An automatic lock is applied which exerts a downward pressure of about 35 lbs. on the wing of each coupler. This holds the gaskets tightly together at all times and prevents uncoupling on sharp curves while permitting automatic uncoupling without damage to the hose in case the train parts. The curved lugs and hooks of the couplers are milled on special machines.

Panama Canal Appropriation.

The bill making a short time appropriation for the expenses of the Panama Canal, which called for \$16,500,000 and was amended in the House to read \$11,000,000, has been passed by the Senate, the Upper House agreeing to the lower figure.

Don't Let the Officers Do All the Work.

Mr. C. E. Lee, assistant general manager of the Boston & Maine, addressing a brotherhood meeting in Boston recently, said: "The time has come when labor cannot say to the employer, 'We must have an increase in wages because we want it.' Nor can employers say, 'You can't have it, because I won't give it to you.' I never expect to see an era of universal peace between labor and the employer, but I do believe that the time has come when the employer and employee can get together and tell what they do desire of each other. While I believe in labor organizations, they never can take the place of hard work to secure advancement. * * * Any organization that is worth joining is worth backing up. At-

tend the meetings and don't let the officers do all the work. Don't be too critical of the committees that wait on the management. It is one of the meanest things to elect a committee and then kick about its work. The stronger they are the better they suit me.

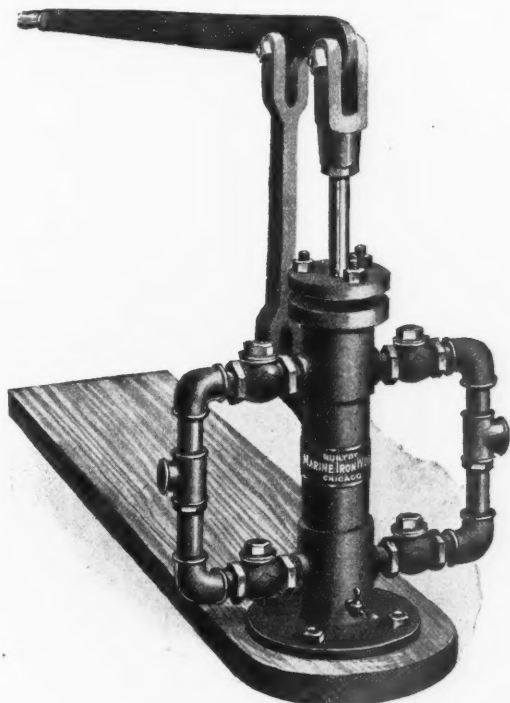
Collision on the "Harlem Line."

In a collision of two northbound trains at converging tracks at 104th street and Fourth avenue, New York City, on Tuesday evening last, one passenger was killed and 30 were injured, all of the victims being in one car of train No. 222 of the New York, New Haven & Hartford. The two trains, both filled with suburban passengers, had left the Grand Central station, three miles south of the point of collision, at about the same time; the New Haven train on track No. 4, and the other, a Poughkeepsie local of the New York Central & Hudson River, on track No. 3. At 110th street a preceding train on track No. 4 had been delayed and the signalman had therefore set the crossover track to turn the New Haven train from track 4 to track 3. The engineman of the Poughkeepsie train appears to

have disregarded the signals which should have stopped him before he reached the crossover, and his engine struck the side of the New Haven train, overturning one car. The signals are high semaphores on a bracket post, at the left of the tracks, this part of the road being operated "left-handed."

A Boiler Test Pump.

A pump for making hydrostatic tests on boilers, pipes, etc., is shown in the accompanying illustration. It is double-acting, enabling one man to pump against 500 lbs. pressure. It has a 5-in.



Hydrostatic Test Pump.

stroke, 1-in. suction and $\frac{3}{4}$ -in. discharge. The lever handle is forged, also the fulcrum and the knuckle connection. The cylinder is semi-steel and the piston is of bronze. For inspectors' or yard use the base shown in the illustration is most convenient. For fastening down in a permanent position a square base is furnished. The pumps are subjected to a rigid test before shipment. They are made by the Marine Iron Works, Chicago.

Disastrous Fire at Twenty-Third Street Ferry.

The new ferry-house of the Delaware, Lackawanna & Western at West Twenty-third street, New York City, was completely destroyed by fire on Wednesday last, and the similar structure of the Central of New Jersey, adjoining it on the south, which also was new, had its interior gutted. Gangs of painters were at work beneath the Lackawanna ferry-house, and it is believed that the fire started among their materials. The ferry-houses of the Erie and of the Pennsylvania, adjoining that of the Lackawanna on the north, were threatened, but were saved.

"The Public is Satisfied."

A certain western railroad which has not yet been "reorganized" by Wall street is still owned and operated by the blunt-spoken old lumberman who built it. Last year, after a particularly severe accident upon it, the agent for an automatic block signal called and tried to get a contract. The old lumberman examined the device attentively and finally said: "Wal, I reckon it is a pretty machine. I like to sit here and see it work myself, it's so all-fired sure. But come to using it on my road—now, young feller, I've been running a railroad some longer'n you, and I'll tell you something. Accidents is bound to happen about once in so often, no matter what you do. I've got three brakemen in jail now, and I've vowed to hang the next one, and the public is pretty well satisfied. But what satisfaction is it going to be to any one if I go to work and hang an old automatic machine?"—*Youth's Companion*.

Manufacturing and Business.

Falls hollow iron has been specified for the staybolts of a number of locomotives recently ordered from the Baldwin Locomotive Works by the Seoul-Fusan Railroad.

The Mark Flather Planer Co., Nashua, N. H., has received an order for a 38-in. x 16-ft. frog and switch planer for the Kingston shops of the Delaware, Lackawanna & Western.

The Miller-Collins Company, Contracting Engineers, 1133 Broadway, New York, has been awarded the contract for the designing and erection of a new foundry building at Long Island City, for the Union Ballast Co., New York. This building will be built on pile foundations, with concrete block walls, structural steel frame, plank and composition roof. Work will be started at once. The Miller-Collins Company are in the market for prices on cement, sand, piles, lumber, sash, doors, window frames, roofing, structural steel, etc.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

American Society of Civil Engineers.

At the meeting of this society December 20, a paper on "The Inspection of Treatment for the Protection of Timber by the Injection of Creosote Oil," by H. R. Stanford, was presented. This paper was printed in the "Proceedings" for November, 1905.

Franklin Institute.

At a stated meeting of the Institute held December 20, there was a paper on "Hydraulic Mining in British Columbia and Alaska," with illustrations, by Howard W. DuBois, Mining Engineer, Philadelphia. At a meeting of the Sections held December 21, the program included a paper on "Electro-Chemical Calculations," by Dr. Joseph W. Richards, of Lehigh University, Bethlehem, Pa.

St. Louis Railway Club.

The December meeting of this club took the shape of the annual Christmas tree entertainment. It was held on the 9th, and consisted of music, vaudeville, and various humorous specialties. If the show was as funny as the program, it must have been highly entertaining; for the bill has a laugh in every line.

The Railway Signal Association.

Secretary H. S. Balliet, New York City, announces that the next meeting of this Association will be held at the Grand Union Hotel, New York City, January 9. The following papers will be presented:

Signaling on the East Bengal State Railway, by George K. Rogers, of Calcutta.

The care of storage batteries, by H. W. Lewis (Lehigh Valley).

Preliminary report on installation and maintenance of storage batteries, by I. S. Raymer, Chairman of the committee.

Line Wire, by F. F. Fowle, of the American Telephone & Telegraph Co.

Rubber Covered Wire will be brought up for discussion, with particular reference to the feasibility of a system for inspection. An amendment to the Constitution and one to the By-Laws will be voted on.

PERSONAL.

—Mr. Franklin K. Lane, who is to succeed Hon. J. W. Fifer on the Interstate Commerce Commission, is a lawyer in San Francisco.

He is a prominent Democrat and took an active part in the reorganization of that party, resulting in the successful reform movement in San Francisco. Mr. Lane has also had newspaper experience, having been with the *San Francisco Chronicle* and at one time editor of the *Tacoma News*.



F. K. Lane.

—Mr. J. C. Lincoln, recently appointed Assistant Freight Traffic Manager of the Missouri Pacific, has spent nearly all of his railroad life on that road. In 1876, he was clerk in the Car Service department, and later went into the Superintendent's office. He then went to the St. Joseph & Denver as clerk in the General Freight and Passenger department. In 1883,

he returned to the Missouri Pacific as commercial agent. He was appointed Assistant General Freight Agent in 1890 and First Assistant General Freight Agent in 1897. Two years later he was appointed General Freight Agent, where he has been until his present appointment.

—Mr. W. J. Spicer, who died recently at his home in Detroit, was born in England in 1832 and went to Canada at the age of 21. After serving for several years as a freight agent on the Great Western, he became, in 1861, Superintendent of that road. In 1884, he was appointed General Manager of the Grand Trunk lines west of the Detroit and St. Clair rivers, remaining there for about ten years. He then retired from active service, but continued as director of the Grand Trunk.

—Mr. J. A. Shepherd, who was recently appointed Superintendent of the Maryland division of the Western Maryland, entered railroad service in 1892 as an assistant agent on the Wabash. He served at various offices for four years, and then was made despatcher at Decatur, Ill. In 1898 he was appointed assistant chief despatcher. In 1902, he was appointed chief despatcher, but the next year went to the Western Maryland as Superintendent of Transportation of that road and of the West Virginia Central & Pittsburg.

—Mr. Charles B. Peck, Manager of the Texas Car Service Association and President of the National Association of Car Service Managers, died at Houston, Texas, on December 10. He was born in 1840, and at the age of 15 began railroad service in an office of the Milwaukee & Mississippi. He became station agent of the Milwaukee & Prairie du Chien (now the Chicago, Milwaukee & St. Paul), and in 1867 became station agent of the Leavenworth, Lawrence & Galveston. He was promoted to be General Freight Agent and then General Superintendent of that company and later became General Manager of the Chicago & Grand Trunk. He left this office to become Vice-President and General Manager of the Atlantic & Danville, and in 1892 was appointed General Manager of the San Antonio & Aransas Pass.

—Mr. Ira A. McCormack, who is now General Superintendent of the Electric Division of the New York Central & Hudson River, was born in 1859. In 1872, he entered railroad service as a telegraph operator on the Pittsburg & Connellsville, and the next year went to the Pittsburg, Fort Wayne & Chicago, where he remained for 13 years as brakeman, conductor, freight and ticket agent and yardmaster. He then became yardmaster on the West Shore, and in 1888 trainmaster on the same road. In 1891, he went to the Pittsburg & Lake Erie as trainmaster at Pittsburg, but soon after took a similar position on the New York Central. He then went to Chicago to install automatic signals on the Chicago & North-Western and the Illinois Central, and later to the Lake Shore & Michigan Southern as trainmaster. In 1895 he became General Superintendent of the Brooklyn Rapid Transit, and in 1899 Vice-President of the Syracuse Rapid Transit. From here he went to Cleveland as General Manager of the Cleveland Electric Street Railway, and in 1902 returned to the New York Central as Assistant Manager of the Grand Central Station. He was promoted to the position of Manager of the "Grand Central Station and Harlem Line," which title is now changed to his present one.



I. A. McCormack.

1895 he became General Superintendent of the Brooklyn Rapid Transit, and in 1899 Vice-President of the Syracuse Rapid Transit. From here he went to Cleveland as General Manager of the Cleveland Electric Street Railway, and in 1902 returned to the New York Central as Assistant Manager of the Grand Central Station. He was promoted to the position of Manager of the "Grand Central Station and Harlem Line," which title is now changed to his present one.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—J. F. Scott has been appointed Assistant Secretary at Topeka, Kan., and A. O. Wellman, Assistant Treasurer at the same place, relieving E. Wilder, Secretary and Treasurer, who is in ill health.

Baltimore, Chesapeake & Atlantic.—C. E. Pugh, Second Vice-President of the Pennsylvania, has been elected President and Director of the B., C. & A. and the Maryland, Delaware & Virginia, succeeding S. M. Prevost.

Canadian Pacific.—J. B. Elliott, Master Mechanic at Montreal, Que., has been appointed General Master Mechanic of the lines east of Fort William, with office at Angus Shops, Montreal.

Chicago Great Western.—J. E. Chisholm, Master Mechanic at Oelwein, Iowa, has been appointed General Master Mechanic, with office at that place.

Cleveland, Akron & Columbus.—See Pennsylvania Lines West.

Colorado & Southern.—J. M. Herbert, Vice-President and General

Manager, has been elected First Vice-President. A. D. Parker, Vice-President in charge of the auditing department, has been elected Second Vice-President in charge of operating, traffic and auditing. J. H. Young, General Superintendent, has been appointed General Manager, succeeding Mr. Herbert, with office at Denver, Colo.

W. A. Webb has been appointed Assistant to the Second Vice-President, with office at Denver, Colo.

Delaware, Lackawanna & Western.—G. E. Hustis, Auditor of Disbursements of the Michigan Central, has been appointed General Auditor of the D., L. & W., with office at New York, succeeding O. C. Post, deceased.

Grand Trunk.—N. C. Rothschild has been elected a director, succeeding L. J. Seargeant, deceased.

Great Northern.—G. T. Slade, General Superintendent, has returned from a long leave of absence. H. A. Kennedy, Acting General Superintendent, resumes his duties as Assistant General Superintendent, with office at Spokane, Wash. J. H. O'Neill, Acting Assistant General Superintendent, returns to Whitefish, Mont., as Superintendent.

Lehigh & New England.—Daniel Hardy, General Superintendent, has resigned to go into private business, effective Jan. 1, 1906.

Maryland, Delaware & Virginia.—See Baltimore, Chesapeake & Atlantic.

Michigan Central.—N. B. Ackley has been appointed Auditor of Disbursements, with office at Detroit, Mich., succeeding G. E. Hustis, resigned. See Delaware, Lackawanna & Western.

Midland Valley.—See Philippine Roads.

Missouri Pacific.—M. C. Markham, Assistant to the President of the Western Pacific, has been appointed Assistant to Vice-President C. S. Clarke of the Missouri Pacific, effective January 1, and his duties will be those of director of traffic.

National Lines of Mexico.—See Tehuantepec National.

Pennsylvania.—A. B. Clark, Supervisor at Pittsburg, Pa., has been appointed Assistant Engineer at Renovo, Pa., succeeding D. R. Mehaffey, transferred to the office of the Chief Engineer of Maintenance of Way.

Pennsylvania Lines West.—R. C. Barnard, Superintendent of the Cleveland, Akron & Columbus, has been appointed Superintendent of the Cincinnati division of the Pennsylvania Lines West, succeeding J. A. McCrea, resigned, to go to the Long Island. W. B. Wood, Superintendent at Richmond, Ind., succeeds Mr. Barnard. N. Neff, Engineer of Maintenance of Way at Chicago, succeeds Mr. Wood. All these appointments are to take effect January 1.

Philippine Roads.—F. A. Molitor, Chief Engineer of the Midland Valley, has been appointed, by the Secretary of War, Supervisor of Railroads in the Philippines.

Tehuantepec National.—W. B. Ryan, Traffic Manager of all the roads comprised in the National Lines of Mexico, has resigned, effective Jan. 1, 1906, but remains General Traffic Manager of the Tehuantepec National.

Western Pacific.—See Missouri Pacific.

White Pass & Yukon.—A. B. Newell, Vice-President and General Manager, has resigned. A. L. Berdoe, Comptroller, succeeds Mr. Newell as General Manager, with offices at Vancouver, B. C., and Skaguay, Alaska.

LOCOMOTIVE BUILDING.

The Great Northern has ordered 85 locomotives from the Baldwin Works.

The Raleigh & Pamlico Sound, it is reported, has ordered two locomotives.

The Mexican Central, it is reported, will shortly order a number of locomotives.

The Minneapolis & St. Louis, it is reported, has ordered two locomotives from the American Locomotive Co.

The Virginia Coal, Iron & Coke Company has ordered two saddle tank locomotives from the Davenport Locomotive Works.

The McCall Ferry Power Company, New York, has ordered five four-wheel saddle tank, standard-gage, construction locomotives from the Davenport Locomotive Works.

The Northern Pacific, it is reported, is figuring on 25 locomotives. These are in addition to the 80 locomotives which were recently reported as ordered from the American Locomotive Co.

The Chicago, Burlington & Quincy has ordered 15 simple Pacific (4-6-2) locomotives from the Baldwin Locomotive Works. These locomotives will weigh 222,000 lbs., with 150,000 lbs. on the drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 74 in.; radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 3,773 sq. ft.; 305 tubes, 2¼ in. in diameter and 20 ft. long; fire-

box, 9 ft. $\frac{1}{4}$ in. long and 6 ft. $\frac{1}{4}$ in. wide; grate area, 54.25 sq. ft.; tank capacity, 8,000 gallons of water, and coal capacity, 13 tons.

The Susquehanna & New York, as reported in our issue of December 15, has ordered one simple consolidation locomotive from the Baldwin Locomotive Works. This locomotive will weigh 215,000 lbs., with 125,000 lbs. on drivers; cylinders, 21 in. x 24 in.; diameter of drivers, 46 in.; wagon top boiler, with a working steam pressure of 190 lbs.; 306 tubes; firebox, 95 in. x 42 in. The tender will have a capacity for 4,500 gallons of water and five tons of coal. The special equipment will include: Westinghouse air-brakes, Monitor injectors, metallic piston and valve rod packing and pneumatic sanding devices.

The Texas & Pacific is building three simple switching locomotives at its Marshall, Tex., shops. These locomotives will weigh 39 tons; cylinders, 17 in. x 24 in.; diameter of drivers, 44 in.; straight boiler, with a working steam pressure of 150 lbs.; heating surface, 1,145 sq. ft.; 148 tubes, $2\frac{1}{2}$ in. in diameter and $13\frac{1}{2}$ ft. long; firebox, 5 ft. 2 in. long and 2 ft. 10 in. wide; grate area, 15 sq. ft.; tank capacity, 2,500 gallons of water, and coal capacity, $4\frac{1}{2}$ tons. The special equipment includes: Westinghouse air-brakes, Sterlingworth brake-beams, Tower couplers, Detroit injectors, U. S. metallic piston and valve rod packings, Coale safety valves, Nathan sight-feed lubricators, Union Spring & Manufacturing Co.'s springs, and Crosby steam gages.

The Canadian Pacific is building at its Angus shops six Pacific (4-6-2) locomotives and 10 switching (0-6-0) locomotives, for November and December, 1905, and January, 1906, delivery. The Pacific locomotives will weigh 215,000 lbs., with 140,000 lbs. on the drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 69 in.; radial stayed wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 3,122 sq. ft.; 209 Mannesmann & Canadian Pacific special tubes, $2\frac{1}{4}$ in. in diameter and 20 ft. long, and 22 superheater tubes, 5 in. in diameter and 20 ft. long; Canadian Pacific special firebox, $102\frac{1}{2}$ in. x 70 in.; grate area, 49.7 sq. ft.; tank capacity, 5,000 imperial gallons of water, and coal capacity, 10 tons. The switching locomotives will weigh 126,000 lbs.; cylinders, 18 in. x 26 in.; diameter of drivers, 52 in.; radial stayed wagon top boiler, with a working steam pressure of 200 lbs.; heating surface, 1,544 sq. ft.; 234 Canadian Pacific special tubes, 2 in. in diameter and 11 ft. $5\frac{1}{2}$ in. long; Canadian Pacific special steel firebox, $96\frac{3}{4}$ in. x $42\frac{3}{4}$ in.; grate area, 29 sq. ft.; tank capacity, 3,500 imperial gallons of water, and coal capacity four tons. The special equipment for both includes: Westinghouse air-brakes, Krupp and open hearth steel axles, "Little Giant" bell ringers for Pacific locomotives, magnesia and plastic boiler lagging, Simplex brake-beams, Canadian Pacific standard brake-shoes, Washburn pilot and Tower tender couplers, Pyle-National headlights and Hancock injectors for Pacific locomotives, Canadian Pacific standard journal bearings, U. S. metallic piston and valve rod packings, "World" brand safety valves, Leach double sanding devices, Richardson sight-feed lubricators for Pacific locomotives, and Detroit sight-feed lubricators for switching locomotives, Crucible springs, Star steam gages, Krupp crucible driving wheel tires and Krupp open hearth truck and tender wheel tires for Pacific locomotives.

CAR BUILDING.

The Southern is reported to be in the market for 10,000 freight cars.

The Coal & Coke has ordered 100 cars from the Standard Steel Car Co.

The Asheville Electric Company has ordered two cars from the J. G. Brill Co.

The Chicago & Alton, it is reported, is in the market for 200 refrigerator cars.

The Halifax & Southwestern has ordered 50 flat cars from Rhodes, Curry & Co.

The Lake Shore & Michigan Southern is to build 25 passenger cars at its own shops.

The Philadelphia & Reading, it is reported, is in the market for 1,000 gondola cars.

The Solway Process Company has ordered 60 freight cars from the Middletown Car Works.

The Toledo, St. Louis & Western, it is reported, is in the market for a large number of box cars.

The Buffalo, Rochester & Pittsburgh has ordered 200 steel cars of 100,000 lbs. capacity from the Standard Steel Car Co.

The Wisconsin & Michigan, as reported in our issue of December 1, has ordered 200 ore cars of 100,000 lbs. capacity from Barney & Smith.

The Philadelphia & Reading, as reported in our issue of Decem-

ber 15, has ordered 900 gondola cars from the Middletown Car Works.

The Cincinnati, Milford & Loveland Traction, Milford, Ohio, has ordered two cars from the Cincinnati Car Co.

The Cuba Eastern has ordered 40 freight cars of 60,000 lbs. capacity and five passenger coaches from the American Car & Foundry Co.

The Aurora, Elgin & Southern, it is reported, is in the market for 13 passenger cars and has ordered one milk car from the Jewett Car Co.

The Great Northern, it is reported, has ordered 10 sleeping cars from the Pullman Co. and 68 passenger cars from Barney & Smith and the American Car & Foundry Co.

The St. Louis Construction & Equipment Company is contemplating the purchase of a number of freight cars, including about 1,000 coal cars of 100,000 lbs. capacity.

The Chicago & Milwaukee Electric has ordered 10 coaches from the Jewett Car Co., 10 parlor cars from the Pullman Co., and will probably be in the market for additional equipment soon.

The Butte, Anaconda & Pacific has ordered 100 steel hopper ore cars of 100,000 lbs. capacity from the Standard Steel Car Co., for January, 1906, delivery. These cars will be 25 ft. 10 in. long, 9 ft. $5\frac{1}{2}$ in. wide and 8 ft. 9 in. high, inside measurements.

The New York, New Haven & Hartford, it is reported, has ordered 41 coaches, 15 combination passenger and smoking cars, 20 baggage cars, four combination baggage and mail cars and 20 carriage cars from Osgood, Bradley & Sons, and five sleeping cars from the Pullman Co.

The Southern, as reported in our issue of December 15, has ordered 7,500 box cars of 60,000 lbs. capacity and 2,500 steel gondola cars of 100,000 lbs. capacity as follows: One thousand two hundred and fifty box cars from the Western Steel Car & Foundry Co., 1,750 box cars from the American Car & Foundry Co., 3,000 box cars from the Mt. Vernon Car Manufacturing Co., 1,500 box cars from the Lenoir Car Works, 600 steel gondola cars from the Standard Steel Car Co., and 1,000 steel hopper gondola cars from the American Car & Foundry Co.

The Texas & Pacific, as reported in our issue of December 15, is building 50 Rodger ballast Hart convertible cars of 80,000 lbs. capacity at its Marshall, Tex., shops, for December delivery. These cars will weigh 36,500 lbs., and measure 34 ft. long, 10 ft. 2 in. wide and 9 ft. high, over all. The special equipment includes: Common Sense bolsters and trucks, Sterlingworth brake-beams, Westinghouse air-brakes, Tower couplers, International draft rigging, Union Spring & Manufacturing Co.'s springs and Marshall Car Wheel & Foundry Co.'s wheels.

The Chicago, Indianapolis & Louisville, as reported in our issue of December 15, has ordered one combination car, three first-class coaches and five excursion cars from the American Car & Foundry Co. The combination car is for February, 1906, delivery, the first-class coaches are for April, 1906, delivery, and the excursion cars are for May, 1906, delivery. The combination and excursion cars are 75 ft. long, the first-class coaches are 70 ft. long, and all cars are 8 ft. 10 in. wide, inside measurements. The special equipment for all includes: National-Hollow brake-beams, "Brown" brake-shoes, Westinghouse air-brakes, National couplers, Dayton Supply Co.'s curtain fixtures, Pantasote curtain material, Harrison dust guards, Consolidated heating system, Symington journal boxes, Pintsch gas light, Sessions platforms, Pittsburg Spring & Steel Co.'s springs, Pullman vestibules and Paige steel tired wheels. Other specialties are: Vendor Co.'s automatic ventilators.

The Delaware, Lackawanna & Western, as reported in our issue of December 1, has ordered 500 double hopper bottom steel cars of 80,000 lbs. capacity, 500 steel frame gondola cars of 80,000 lbs. capacity, 18 milk cars of 55,000 lbs. capacity, 10 express cars, and two broad vestibule coaches from Barney & Smith and 15 suburban coaches and three combination passenger and baggage cars from the American Car & Foundry Co. All cars are for May and June, 1906, delivery. The double hopper bottom steel cars will weigh about 36,000 lbs., and measure 33 ft. $6\frac{1}{2}$ in. long, 10 ft. wide and 10 ft. $3\frac{3}{4}$ in. high, over all. The steel frame gondola cars will weigh about 37,000 lbs., and measure 44 ft. $3\frac{1}{4}$ in. long, 9 ft. $11\frac{1}{2}$ in. wide and 7 ft. $5\frac{1}{2}$ in. high, over all. The milk cars will weigh 73,000 lbs., and measure 55 ft. $3\frac{1}{2}$ in. long, 10 ft. $2\frac{1}{2}$ in. wide and 13 ft. 1 in. high, over all. The express cars will weigh about 76,000 lbs., and measure 63 ft. $6\frac{1}{2}$ in. long, 10 ft. $\frac{1}{4}$ in. wide and 14 ft. $\frac{1}{2}$ in. high, over all. The vestibule coaches will weigh about 82,000 lbs., and measure 68 ft. 10 in. long, 10 ft. wide and 14 ft. $7\frac{1}{2}$ in. high, over all. The suburban coaches will weigh about 78,000 lbs., and measure 59 ft. long, 8 ft. $10\frac{1}{2}$ in. wide and 9 ft. $6\frac{1}{2}$ in. high, inside measurements. The combination passenger and baggage cars will be 54 ft. $2\frac{1}{2}$ in. long, 8 ft. $10\frac{1}{2}$ in. wide and

9 ft. 6½ in. high, inside measurements. The special equipment for all includes: Simplex bolsters, Buffalo brake-beams and Lappin steel back brake-shoes for double hopper bottom and steel frame gondola cars, Long-Streeter steel back brake-shoes for the balance, Westinghouse air-brakes, Magnus Metal Co.'s brasses, Gould couplers, Forsyth automatic curtain fixtures and Pantasote curtain material for vestibule, suburban and combination cars, Dunham doors for double hopper bottom cars, Miner draft rigging, and Pullman journal boxes for milk, express, vestibule, suburban and combination cars, Woodman journal boxes for double hopper bottom and frame gondola cars, Pintsch gas light for express cars, Commercial acetylene light for vestibule, suburban and combination cars, American Car & Foundry Co.'s steel platforms for suburban and combination cars, Barney & Smith seats for vestibule coaches, Simplex Railway Appliance Co.'s springs, Barber arch-bar trucks for double hopper and steel frame gondola cars, Pullman broad vestibules for vestibule coaches, and Boies wheels for milk, express, vestibule, suburban and combination cars.

BRIDGE BUILDING.

ANACONDA, MONT.—An agreement, it is said, has been reached between the city officials and the Butte, Anaconda & Pacific to jointly build a steel bridge over Nevada avenue. The city's share of the cost will be \$10,000.

ARKANSAS.—The bill authorizing the Rock Island, Arkansas & Louisiana to build bridges over the Ouachita river and other navigable rivers in Arkansas has been passed by both houses of Congress. (December 15, p. 192.)

BARRIE, ONT.—A bridge is to be built over the Harlem river south of Bradford by Simcoe County Council; also a bridge over the Sturgeon river east of Vasey.

DOMINION CITY, MAN.—A combined railroad and highway bridge is to be built over the Red river at Morris. It is reported that the Canadian Northern will put up the structure if this government agrees to allow it a subsidy.

JACQUET RIVER, N. B.—Surveys have been completed by the Provincial Public Works department for building a stone and steel bridge over the Jacquet river here to cost \$15,000.

JEFFERSON CITY, TENN.—A contract has been given to J. T. Monday for building a bridge for the Southern Railway at this place. The contract for building several others on the line of the Southern on the east end of the Knoxville division has also been let to the same party.

LEXINGTON, NEB.—Bids are wanted January 10 by R. S. Thornton, County Clerk, for building all the bridges that may be needed in Dawson county during 1906.

PITTSBURG, PA.—A contract has been given to William B. Scaife & Sons Co. for building a new trestle over Lowrey's run for the Pittsburgh Railways Co. The proposed structure will be 455 ft. long, varying from 30 ft. to 101 ft. in height, with girder spans from 26 ft. to 90 ft. each.

ST. LOUIS, MO.—Plans have been filed by the St. Louis, Kansas City & Colorado for building a number of bridges over Olive street road, North and South road and Hanley road in St. Louis county on its proposed cut-off under construction from Olivet to the inner belt line of the Terminal road.

SALEM, MASS.—Bids are wanted January 4 by the Commissioners of Essex county for building the substructure and the superstructure of a rolling lift bridge over the new canal on Western avenue in Gloucester. Bids are also wanted on the same date for building a bridge over the Danvers river between Salem and Beverly. James P. Hale is Assistant Clerk.

SAN FRANCISCO, CAL.—Plans are being made to put up a steel viaduct about 1,000 ft. long to carry the electric street railroad tracks over the Southern Pacific yards at Channel street.

VAN BUREN, ARK.—A bill was introduced in the House of Representatives December 13, authorizing a bridge over the Arkansas river at or near Van Buren, Ark.

VANCOUVER, WASH.—On December 13, both houses of Congress passed a bill authorizing the Portland & Seattle to build a bridge over the Columbia river. Construction must commence within one year, and the bridge be completed in three years from the date of approval of the act.

Other Structures.

MONCTON, N. B.—The Intercolonial, it is said, is planning to put up new locomotive shops at a cost of about \$500,000.

NEW YORK, N. Y.—The New York Central & Hudson River has filed plans with the Bureau of Buildings for the second of its series of new buildings in connection with the new Grand Central station.

The proposed building will have a frontage of 224 ft. on Lexington avenue, and be 275 ft. deep, and will cover the site of the "Grand Central Palace." The new building will be occupied by the branch U. S. postoffice and for the terminal offices of the company, but will first be used as a temporary station until the main building fronting on Forty-second street is completed. The cost of this structure will be about \$1,000,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATHENS & JEFFERSON CITY (GAINESVILLE MIDLAND).—A contract has been given by this company to Gwathmey & Mackall, of Norfolk, for building its proposed road.

ATLANTIC CITY & SHORE (ELECTRIC).—This company has been formed to operate with electric power the line of the West Jersey & Seashore between Camden, N. J., and Atlantic City by way of Newfield. The line from Newfield to Atlantic City, which is single track, is to be double tracked at once. An account of the plans for electrification is given on page 594 of this issue.

BALTIMORE & OHIO.—At a recent meeting of the board of directors it was decided to four-track the line from Pittsburg, Pa., to Conneville, a distance of 58 miles. The movement of coal and coke over this section is very heavy.

BEAUMONT, SOUR LAKE & WESTERN.—This road, which is building an extension from Sour Lake west to Houston, Tex., a distance of 65 miles, is reported to have let the contract for building 56 miles from Sour Lake to Humble. (October 6, p. 111.)

BRANDON, SASKATCHEWAN & HUDSON'S BAY.—This company has completed track laying on its proposed road from Devil's Lake, N. Dak., to the international boundary. Work is to be pushed on the balance of the road to Hudson's Bay, and if the weather permits, grading will be continued all winter. (November 24, p. 166.)

BRONX, YONKERS & WHITE PLAINS (ELECTRIC).—Incorporation has been granted this company in New York, with a capital of \$110,000, to build an electric railroad 11 miles long, from the borough of the Bronx, New York City, to White Plains and to Yonkers. The directors include: John H. Matthews, C. H. West, George Matthews and M. H. Wood, all of New York City.

BROOKVILLE & MAHONING (PITTSBURG, SHAWMUT & NORTHERN).—Announcement has been made that contracts are to be let this month for extending this road from its northern terminus for a distance of 21 miles. The work includes the excavation of about 500,000 cu. yds. and building 200,000 cu. yds. of embankment, 20,000 cu. yds. of bridge, culvert and masonry work, and 1,000 tons of steel bridges and viaducts. The road is projected as extension of the Pittsburg, Shawmut & Northern toward Pittsburg, south from Hydes, in Elk County, Pa., to Freeport, in Armstrong County, 103 miles. Some of the grading work has been under way since last spring. About 15 miles on the west bank of the Allegheny, between Freeport and East Brady, are graded, and work is in progress at this end.

BUFFALO, TAYLORVILLE & STATE LINE.—A charter has been granted a company under this name in Pennsylvania to build a railroad along Buffalo creek from Taylorstown, Washington County, to the West Virginia state line near Broom's station, where connection will be made with the railroad which is partially built from Wellsburg to Tate's Run. The company is being financed by Pittsburg and Claysville capitalists. At Taylorstown, connection will be made with the Baltimore & Ohio. The promoters of the proposed road have large coal fields along Buffalo creek.

CALIFORNIA MIDLAND.—An officer writes that contracts are to be let next month for building this proposed railroad, which is to be equipped for both steam and electricity, from Marysville, Yuba County, Cal., through Grass Valley to Auburn. The maximum grade will be 2.5 per cent. The work includes the building of three bridges. John Martin is President, and C. A. Trow, Chief Engineer, of Sacramento, Cal. (November 24, p. 166.)

CANADIAN PACIFIC.—This company, it is said, will lay new tracks on its line from Lethbridge to Kootenay Landing, a distance of 200 miles. New bridges will also be put in, the track rebalasted and other improvements made.

CHICAGO, LAKE SHORE & SOUTH BEND (ELECTRIC).—Contracts have been given by this company for building its proposed road to connect Chicago with Cleveland and Cincinnati. To complete the Cleveland line there remains to be built a line between Fort Wayne and Warsaw, Ind., and plans now under way call for the completion of this branch within a year. Connection between Cincinnati and Chicago will be made over the Western Ohio and the Cincinnati, Dayton & Toledo. Edwin Hanna, J. B. Hanna and other Cleveland capitalists are interested.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Bids are wanted

January 1, 1906, by W. M. Duane, Cincinnati, Ohio, Superintendent of Construction, for grading on the St. Louis division of this road between Indianapolis, Ind., and Lena. The work includes the excavation of 4,000,000 cu. yds. of earth. Bids are also wanted for work on the Cincinnati division between Middletown, Ohio, and Miamisburg, which calls for the excavation of 600,000 cu. yds. of earth, as mentioned on advertising page 22 of this issue.

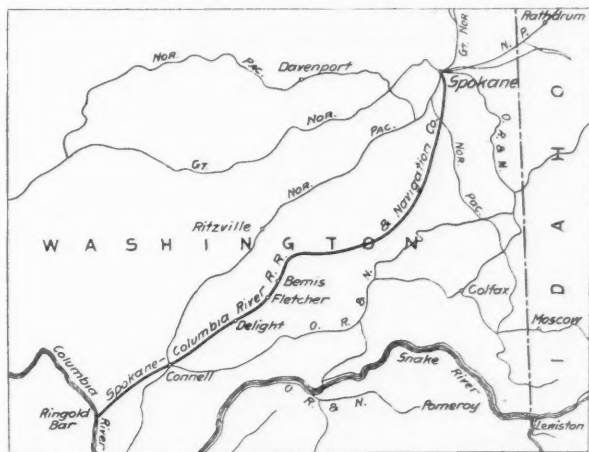
Work has been commenced by this company straightening its roadbed and reducing grade on the Cairo division near Swango Hill, and on the removal of heavy grades at Swango. The work covers a distance of five miles.

CRITTENDEN RAILROAD.—This company, which has a capital of \$275,000, and is owned by the Crittendon Lumber Company, has completed 15 miles of railroad from Earle, Ark., on the St. Louis, Iron Mountain & Southern, to Heath, on the Rock Island-Frisco System.

DUNLAP & REDSTONE.—A charter has been granted a company under this name in Pennsylvania with a capital of \$200,000, to build a railroad for a distance of about 10 miles, to open up coke fields controlled by W. J. Rainey in Menallen and Redstone townships, Fayette County.

GAINESVILLE MIDLAND.—See Athens & Jefferson City above.

SPokane-COLUMBIA RIVER RAILROAD & NAVIGATION.—An officer writes that grading work is under way on this proposed road from Spokane, Wash., southwest to Ringold Bar, on the Columbia river, where water connection will be made to Portland. The contract calls for the completion of 63 miles of the line by May 1, 1906, and an additional 85 miles by December 1, 1906. The line will run through a fine wheat growing section, and is expected to be in opera-



Spokane-Columbia River Railroad & Navigation Company.

tion by next autumn. Track laying will be begun about January 15 by the Eldenbell Construction Co., 42 Broadway, New York, who have the contract. Additional contracts for grading and bridge work have been let to M. P. Zindorf, of Connell, Wash. The work will be very light. William F. Kyle is President, and W. S. Foster, Chief Engineer, both of 112 Wall street, Spokane, Wash. (November 24, p. 167.)

GREEN BAY, OSHKOSH, MADISON & SOUTHWESTERN.—An officer writes that grading has been commenced on 15 miles of the line from Shawano, Wis., northwest of its proposed road to run from Madison, Wis., to North Crandon, on the Minneapolis, St. Paul & Sault Ste. Marie, a distance of 220 miles. The contractors are McDonnell, O'Connor & Co., of Grand Rapids, Mich. W. K. Rideau is President; Leander Choate, Vice-President; R. H. Edwards, Secretary and Treasurer, and C. H. Hartley, General Manager, all of Oshkosh, Wis. (November 24, p. 166.)

KANSAS CITY, MEXICO & ORIENT.—Profiles and maps of the final survey have been submitted by this company to the Mexican Government for approval for its line through the Sierra Madres in the western portion of Mexico. The maximum grade will be 2½ per cent., and the greatest curvature 8 degrees. According to the survey, the road will run for several miles along the brink of a gorge 6,000 ft. deep and a mile wide. There remains about 200 miles of road through the mountains yet to be constructed to connect the Pacific coast with the interior. (October 20, p. 126.)

KNOXVILLE & MARYVILLE (ELECTRIC).—An officer writes that contracts will be let within 30 days by this company for building its proposed electric road from Knoxville south through Vestal, Rockford and Scottsville to Maryville, a distance of 16 miles. The work includes the building of one steel or concrete bridge. W. S. Nash

of Knoxville is President, and Smith & Steele are agents for the company.

OKLAHOMA & TEXAS.—An agreement has been made by this company with the town of Lindsay, Ind. T., granting the company 10 miles of right of way through that town. (September 22, p. 95.)

PENNSYLVANIA.—See Pennsylvania & Newark below.

PENNSYLVANIA & NEWARK.—This company has been incorporated in New Jersey by Pennsylvania Railroad interests, with a capital of \$500,000 to build a railroad from Trenton northeast to Newark, paralleling the present line of the Pennsylvania between those two points. The new road will provide an additional double-track line to be used for freight to relieve the existing line. The incorporators are: A. J. Cassatt, William A. Patton, Samuel Rea, T. D. Cuyler, W. H. Barnes, Henry Tatnall and F. L. Sheppard.

PITTSBURG, SHAWMUT & NORTHERN.—See Brookville & Mahoning above.

PORTLAND & BRUNSWICK (ELECTRIC).—Application has been made by this company which operates an electric line from Brunswick to Yarmouth in Maine, to build an extension of its road through Yarmouth, Falmouth and Cumberland, Me., connecting with Portland, a distance of 12 miles. E. J. Lawrence, A. B. Page, S. A. Nye, A. F. Gerald and C. W. Davis, of Waterville, Me., are interested.

RICHMOND & CHESAPEAKE BAY (ELECTRIC).—Contracts have been let by this company to Phillips & Alport, of Richmond, Va., for building its proposed extension from Brook Turnpike to Hungary road, and to H. H. George, also of Richmond, to build the balance of its proposed road to Ashland, Va. (December 8, p. 184.)

ROGERS SOUTHWESTERN.—This company, which was incorporated last year, is being financed by capitalists of Rogers, Benton County, Ark., and has completed surveys and secured rights of way for building its proposed road from that place southwest to Springtown, a distance of 20 miles. W. R. Felker, of Rogers, is interested.

SOUTH & WESTERN.—This company, it is reported, will soon let contracts for building an additional 200 miles of its proposed road in Virginia and North Carolina. The work will probably be done between Clinchport, Va., and Kingsport, Tenn., and between Spruce Pine, N. C., and Marion, N. C. Work is now under way by the Carolina Construction Co., which was organized by George L. Carter, President of the S. & W., in North Carolina, and it is said that this company may get the entire contract. Other contracts have been let to Walton & Wilson and J. E. Rode & Co. for 50 miles between Kingsport and Erwin, but work has not yet been begun.

UNION PACIFIC.—Articles of incorporation have been filed by this company in Nebraska to build an extension of its Cedar Rapids branch from the northern terminus at Spalding, Neb., northeast for a distance of 150 miles into South Dakota. The proposed line will cross the Chicago & North-Western's Wyoming line.

VIRGINIA & CAROLINA COAST.—The contract has been let to J. G. White & Co., of New York, by this company for building its proposed road from Mackey's Ferry, N. C., through Columbia, thence over Pamlico river by ferry, through Bayboro and over the Neuse river to Beaufort, N. C., a distance of about 113 miles. The work, which will be very light, is now under way. The officers of the company are: R. T. Goodell, President; F. E. Dewey, General Manager, and A. N. Bullitt, Chief Engineer, all of Norfolk, Va.

WABASH.—Official announcement has been made that contracts will shortly be let for building a connecting link between the Wabash and the Union Railroad at Pittsburg. The completion of this link will enable the Wabash to secure some of the freight from the Pittsburg mills, which it has long desired.

WESTERN PACIFIC.—About 2,400 men are at work on the grading of this road between San Francisco and the Nevada state line, and several thousands more would be employed if they could be had. Eighteen miles of the old Tesla coal road are utilized in approaching Stockton. The Utah Construction Co., which has all of the work between Oroville and the Nevada line, is pushing the work on the approaches of the 6,000-ft. tunnel at the summit, and on the 7,300-ft. tunnel at Spring Garden, where the road crosses from Spring Garden Creek to the middle fork of the Feather river. The boring of the tunnels will soon be begun. The following description of the route from Oakland, Cal., to Salt Lake has been given out by officials of the company in San Francisco. The route leaves the company's terminals at Oakland by way of Third street, following the general route of the Southern Pacific as far as Niles. Like the Southern Pacific it enters the Niles Canyon, but on the opposite side of Alameda creek from that occupied by the S. P. The high country in the eastern end of Alameda County is avoided by a 4,000-ft. tunnel that is to enter the hills from a point in Niles Canyon, keeping the grades down to 1 per cent. From the east portal of the Niles Canyon tunnel the route extends to Livermore and then to a connection with the Alameda & San Joaquin Rail-

road, which is to afford the Western Pacific an entrance into Stockton. On the Alameda & San Joaquin a number of curves and gradients are to be corrected. From Stockton to Sacramento, the route lies between the track of the Southern Pacific Company and the Sacramento river. Just how the road will enter Sacramento has not been definitely decided upon. Between Sacramento and Oroville, the new road will lie between the tracks of the Southern Pacific and the Sacramento river, and north of Oroville the road will closely follow the north fork of the Feather river for a considerable distance, and then swing southeasterly to Beckwith Pass, leaving Quincy, the county seat of Plumas county, a few miles to the south and west. Two tunnels, each about 7,000 ft. long, will enable the Western Pacific to keep within maximum grade of 1 per cent. in its climb over the Sierra. Through the Beckwith Pass the new road will parallel for a considerable distance the tracks of the Sierra Valley Railway. Then the road will make a sharp bend to the northeast, passing to the northward of Pyramid Lake, and from that point will shoot straight for Winnemucca. From Winnemucca to Wells it will closely follow the tracks of the Southern Pacific, and from Wells the road will take the straightest possible course to the southern end of Great Salt Lake. In Salt Lake City it will reach the terminals of the Rio Grande Western. Thirty construction camps have been located at various points along the line of the road by the contractors. The entire line from Oakland to Salt Lake, with the exception of that portion of the route that lies in the state of Nevada, is now under contract. No contracts will be given for the work in Nevada for some time to come.

WEST JERSEY & SEASHORE.—See Atlantic City & Shore.

RAILROAD CORPORATION NEWS.

ALABAMA GREAT SOUTHERN.—The shareholders will vote on Dec. 29, on a proposition to liquidate the Alabama Great Southern Railway, Limited, which is an English holding company for the railroad. As the Southern Railway now holds the majority of the outstanding stock of the English company, it has been decided that there is no reason for its further existence. The proposition is to exchange shares of Alabama Great Southern Railroad Company stock at par for the shares of the English company.

BOSTON, REVERE BEACH & LYNN.—This company, a narrow gage road from Lynn to Boston, with 17 miles of line, has declared a semi-annual dividend of 2 per cent. on its \$850,000 capital stock. The annual rate last year was 2 per cent.

CANADIAN PACIFIC.—The sales of land by this company during the month of November were the largest during any fall month in the history of the company, the total being 202,667 acres for \$1,075,165, as compared with the sale in the same month last year of 26,032 acres for \$112,843.

CHICAGO, CINCINNATI & LOUISVILLE.—See Cincinnati, Hamilton & Dayton.

CHICAGO, ROCK ISLAND & PACIFIC.—This company has declared a quarterly dividend of $1\frac{1}{2}$ per cent. on its \$74,842,600 capital stock outstanding. During the year 1904 the annual rate was $8\frac{1}{4}$ per cent., and this year 2 per cent. was paid in January, 2 per cent. in April and $2\frac{1}{4}$ per cent. in October.

CINCINNATI, HAMILTON & DAYTON.—In the application for a receivership the amount of the floating debt of this company, as of Dec. 1, is given as \$6,625,000. The following transactions are mentioned as most seriously damaging the solvency of the C., H. & D.: The purchase of 110,000 shares of the common stock of the Pere Marquette by the C., H. & D. at 125; the tripartite agreement between the Pere Marquette, the C., H. & D. and the Toledo Railway & Terminal Co., under which the last named company was leased at a high rental and \$3,500,000 of bonds guaranteed; the agreement by which the C., H. & D. became liable for one-half of \$3,500,000 bonds issued to buy the Chicago, Cincinnati & Louisville, and also for one-half of the interest on the \$6,000,000 prior liens of the C., C. & L.

It is expected that receiver's certificates will be issued shortly to pay the January interest on the bonds and notes of the company. This interest amounts to \$855,520, and in addition there will fall due at the same time \$70,000 interest on the joint collateral notes issued for the purchase of the C., C. & L., and \$289,382 in dividends on Pere Marquette stock, which constitutes a rental under the lease of that road, making in all \$1,214,902 falling due on Jan. 1, 1906.

The *Boston News Bureau* has given out the following statement obtained from former owners of the C., C. & L.: "The syndicate which built the C., C. & L. was approached in the summer of 1904 by interests representing the Pere Marquette, with a view to purchase. Negotiations culminated on July 5 in a sale of all the stock of the C., C. & L. to the Pere Marquette. The Pere Marquette paid for this stock \$3,500,000 in 4 per

cent. ten-year collateral trust bonds, secured on the \$4,206,000 stock of the C., C. & L. The bonds are Pere Marquette bonds. The syndicate agreed to deliver the C., C. & L. to the Pere Marquette free of all floating debt, and with bonds at \$25,000 a mile including equipment. It was stipulated that, while the road would be delivered immediately for operation, control of the directorate would not pass until the collateral trust bonds were also endorsed by the C., H. & D. The bonds endorsed by the C., H. & D. have not yet been delivered and the original syndicate controls the directorate of the C., C. & L. and holds the executive offices. The C., C. & L. is laid with 70-lb. and 85-lb. rails. It has its own terminals in Cincinnati. It had a contract for terminals on the Chicago Terminal, but the line lacked a connection of nine miles when the road was sold. Under the arrangement for sale, the nine-mile connection was to be built by the new owners with money provided by the sellers, and on deposit in a Boston trust company. That connection has never been built. The money is still on deposit in Boston. No commission was paid to United States Mortgage & Trust Co. or anyone else. . . . The trade was concluded some days before the C., H. & D. bought the Pere Marquette."

DENVER & RIO GRANDE.—The New York Stock Exchange has listed \$1,312,700 additional preferred stock. The proceeds of this issue were used as follows: \$1,200,000 were exchanged for \$750,000 Utah Fuel bonds and \$450,000 cash; \$112,700 were exchanged for \$902,200 Rio Grande Southern stock.

MASSACHUSETTS ELECTRIC.—This company paid no dividends during 1905 on its \$20,557,400 preferred stock. Last year 4 per cent. was paid. The reasons given are the large sums taken from the surplus for reconstruction, and the expectation of further deductions for the same reason. The gross earnings of the company during the year ended September 30th were \$6,734,127, an increase of \$353,264. The net earnings were \$2,277,824, an increase of \$376,482; and the surplus was \$734,310, an increase of \$295,594.

MEXICAN CENTRAL.—The New York Stock Exchange has listed \$11,613,200 additional common stock of this company. Of this issue \$160,000 is to retire old income bonds; \$625,000 to refund the bonds and floating debt of the Chihuahua & Pacific; \$5,000,000 in exchange for 50,000 shares of Mexican Pacific; \$328,200 for income bonds not exchanged; \$1,999,000 to be issued for Mexican Pacific stock for par; \$1,000 for 10 shares of the latter company under agreement from private owners, \$1,000,000 to Ladenburg, Thalmann & Co., and Hallgarten & Co., for funds advanced for new construction, and \$2,500,000 to the Atlantic Construction Company.

MOHAWK VALLEY COMPANY.—A company of this name was incorporated in New York State in February with capital stock of \$100,000 and authority to build railroads, to organize other corporations and to buy, hold and dispose of stocks and bonds of other corporations. The incorporators and first directors were all connected with the New York Central, and included William A. Greer, Assistant Treasurer, and Landreth H. King, Registrar of Contracts, of that company. It was believed at the time that the Mohawk Valley Company was to be a holding company for electric railway properties in which the New York Central and Delaware & Hudson are interested. On December 16, the Mohawk Valley Company, whose headquarters are at Utica, N. Y., filed a certificate of increase of its capital stock to \$10,000,000. This certificate was signed by Horace E. Andrews, of Cleveland, Ohio, who, in connection with the New York Central, has been acquiring various electric railway properties in the central part of New York State. Edward L. Rossiter, Treasurer of the New York Central, as Treasurer of the Mohawk Valley Company, certified on the certificate that Mr. Andrews is the owner of all its capital stock. Whether the increase in the capital stock is for the purpose of taking over the Schenectady Railway, which is owned jointly by the New York Central and Delaware & Hudson, or some other of the electric railroad properties bought by the Andrews-Vanderbilt syndicate, or is made in connection with the electrification of parts of the West Shore Railroad has not as yet been announced.

PERE MARQUETTE.—See Cincinnati, Hamilton & Dayton.

PHILIPPINE ROADS.—See page 195 of this issue.

PITTSBURG, YOUNGSTOWN & ASHTABULA.—The shareholders will vote on Jan. 8 on a proposition to consolidate this 125-mile road with the Newcastle & Beaver Valley, 15 miles long.

SOUTHERN.—See Alabama Great Southern.

UNITED TRACTION & ELECTRIC COMPANY.—N. W. Harris & Co., of New York, are offering \$500,000 first mortgage 5 per cent. gold bonds of 1933 of the United Traction & Electric Company, which owns the entire street railway system of Providence, R. I., and neighboring towns, amounting to about 345 miles of road.

